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EDITORIAL NOTES—GAS, &c.

The Testimony of the Franco-British Exhibition.

STILL incomplete, the Franco-British Exhibition at Shepherd's Bush was inaugurated last Thursday, and, we regret to say, not under the most happy circumstances. But a bad beginning, does not necessarily mean a continuity of ill-fate and a bad ending. We sincerely hope for the reverse. But it is quite evident that the immense amount of work that was undertaken—notwithstanding the notable powers of scheming and organization of which this magnificent conception, and now almost complete reality, has had brought to bear upon it—was not measured with precision in relation to time. A fortnight hence, however, and there will be a vast change, and something approaching finality so far as the present scheme is concerned. Two things are now required to make it ripe in success; and they are that the elements will be kind, and that every part of the British Isles, and the countries abroad, will contribute to the many millions of visitors necessary to ensure real soundness in the balance-sheet. The Exhibition will be a panorama of magnificent spectacle; and for this reason alone it will be worth a visit. But we do hope that the spectacular side of the great show will not prevent many feet, intentionally and fortuitously, wandering into those regions wherein are found the more sombre and prosaic sides of the show. Sombre and prosaic though many exhibits will be in, say, the vast Machinery Halls, here and there will be found much of popular interest—much that concerns domestic economy, household beauty and refinement, and industry. Far above all else in this way, we place the picturesque, demonstrative work (to which the finishing touches will be put during the next week or so) of the Gas Section Committee.

Though the Committee's work is not finished, we can say "Well done!" From the work to the stage to which it has advanced, and from the scheme of the yet to be completed work that has been placed fully before us, and is sketched elsewhere, we know that the uses and conveniences of gas will be demonstrated to the best advantage and in popular style. The ancient order of gas exhibitions, with their over-packed stages of gas fittings and gas appliances, which gave confusion but no enchantment to the view, has here been entirely forsaken; and verily we are not sorry. They served their day—a day when originality in gas display, demonstration, and organization seemed to be quite dead. They were popular in a way, but not impressive. We have now a very different condition of things to meet—a condition of things brought into being and perpetuated by competition. Gas is indicted by its competitors with many heinous offences; it should be the object of present-day gas exhibitions and demonstrations to refute the charges under conditions as near as possible reflecting ordinary use, and by means of the latest improvements available to the householder and other consumers. That is what the Gas Section Committee have attempted to do in the suite of apartments they have constructed, but which are not yet completed, partly owing to a desire not to have the finished work in any way injured by the prevalent dust of the still proceeding stand structural work in the vicinity and the movement of heavy machinery. But the suite of apartments, we have the utmost confidence, will be a perfect study—a perfect eduction—in refinement and serviceability in the home, in which gas and its fittings take prominent part; and so will be the exemplification of the industrial uses of gas, to the length to which the funds placed by the gas undertakings at the disposal of the Committee will permit them to go.

Nothing of the kind seen here has ever been attempted before on such a scale in connection with the demonstration of the uses of gas. It may be said by some—those who do not realize the value of advertisement which can be appreciated not by (say) the professional gas man, but by the far greater public upon whom the gas industry depends for its very being—that the Committee have been over-lavish in the matter of detail. We at all events will not be among their accusers. Lavishness, and an eye to perfection in detail, is part of the scheme of attraction; and there is something more in it than this. Allusion has been made to the charges against gas of competitors—charges prompted by envy, hatred, malice, and uncharitableness. It has been alleged, in ignorance, that gas is an evil thing, and is the agent of only the middle class and of the poor, and that it is unsuitable for the lighting and heating of houses decorated and furnished in the highest pitch of refinement. The contradiction will be here. What can be done in lighting and heating by gas in a house furnished as these apartments will be, can be done anywhere. We shall be shown that there is nothing that is possessed in the way of merit by electricity that is not possessed by gas—even to lighting and extinguishing by the mere pressing of a button, or by the aid of the tumbler switch. In fittings and glassware—but only a few examples will be here—we have the equal in artistic beauty of anything that the makers of electric light fittings can show. And yet among the representatives of our competitors are those who imagine that progress in gas lighting has stood still. Their mistake will be abundantly demonstrated in the Gas Section; and what is more, concerning illuminating and heating efficiency, it can be asserted that, having regard also to cost (from the expense of installation to the expense of the illuminating agent), gas still holds the premier position.

The days of flat-flame burners in well-ordered houses, in houses the abodes of refinement, are past. Twelve candle power for a 5 cubic feet consumption has been displaced by such excellence as up to 25 candles per cubic foot used in the highly artistic bijou inverted and other improved burners of the day; and, in the Exhibition grounds will be found methods of obtaining, by different systems, from 45 candles (in one form of self-contained lamp) up to 60 to 70 candles (in a high-pressure lamp) per cubic foot of gas. Economy and efficiency are, in these latter-day results, given very material form. The gas-fire, too, has been brought up to a high state of efficiency. Simple means of regulating the gas and air supply alone have reduced gas consumptions to nearly half what they were in the old dead and wasteful days. And with regard to the use of gas for cooking, what greater testimony do we need than that the world-renowned caterers at this Exhibition have adopted gas as the means for providing for the needs of the vast multitudes who will be visiting the Exhibition during the next six months. Electricity was at hand—gas was the choice; and Messrs. Lyons and Co. may be given credit for knowing their own business. Returning to the Gas Section, circulating systems of water heating by gas are shown, which can be connected up to the ordinary hot water system of a house, and can be employed at will when the coal range is not in use. Where is the competitor that can show the same ranges of serviceability, economy, and efficiency? These are the things that will be publicly under demonstration in a few days. And the demonstration does not end with that existing of set purpose. We could have wished that the Exhibition authorities had given to gas a larger share in the general lighting; but we are well content with the testimony for gas—specially planned and voluntary and independent—that will be found at Shepherd's Bush. In the Machinery Hall, there are exhibitors showing gas-engines running on both producer gas and town gas; but their testimony is not so potent as that of those other exhibitors who are using town gas—and at the Exhibition authorities' charge of 3s. per 1000 cubic feet!—for various purposes connected with industrial demonstration and entertainment. Some account of these uses will be found in the section of our descriptive article headed "Miscellaneous Uses "of Town Gas." A point to be particularly marked is that in certain buildings, with the Hammersmith Borough Council's electricity supply at the very doors, gas-engines are being

used for the generation of electricity for lighting and power. The Canadian and Australian Sections may be cited as examples. We may suggest to the Committee of the Gas Section that they should have circulars printed for distribution from their stand, mentioning some of the facts regarding this independent testimony to which special attention is directed here; for it will go a long way with the public in supplementing the Committee's own special efforts in demonstrating the domestic and a few of the industrial uses of gas.

Just one point more. It may be asked by some of the undertakings in the Provinces who have contributed, and some who have not contributed (but it is not yet too late for them to do so, for the expenses are great), "Of what avail will "this demonstration be to us?" There can be no doubt that such an exhibition will serve as a magnet to the Metropolis from all parts of the British Isles; and the Committee of the Gas Section are doing their utmost to ensure a display that will be talked about, and will attract from the crowds of pleasure seekers and sight seers. Interested visitors to the suite of apartments who make inquiries as to fittings, and so forth, will be asked for name and address, in order that further information may be supplied by the local gas undertaking, to which the name and address of the inquirer will be forwarded. Perhaps better still would it be to have a visitors' book, in which as many strangers as possible should be asked to put their signatures and addresses. There will, of course, be the visit of the Institution of Gas Engineers to the Exhibition in the third week of June, as well as of the Société Technique towards the end of that month. There will be a programme of combined pleasure and technical interest for the latter; and, with favourable weather, their enjoyment will be complete. Their welcome among us will, as they know from the experiences of 1901 and 1904, be sincere and cordial.

Superseding the Insurance and Renewals Clauses.

THERE is really nothing upon which to congratulate the authorities of the two Houses of Parliament in evolving from the old insurance fund and the renewals fund a new reserve to be called the "Special Purposes Fund." It has been known for some two or three months that the authorities were contemplating either the refusal of further powers to create a renewals fund or a modification of the empowering clause. But the result of their long consideration of the matter is not on all points remarkable for lucidity or for perspicacity. There is no objection to the amalgamation of the insurance and the renewals funds; nor is there any great objection to making the purposes of the old insurance fund chargeable on a new fund which may only be accumulated at the rate and to the extent that was allowed in the case of the discarded renewals fund alone. The first objection to the clause is that, in the administration of this new fund, the decisions of directors are subject to endorsement by a chartered accountant or an incorporated accountant, being an auditor of the company, or specially appointed for the purpose by the Board of Trade. The circuitous manner of obtaining such approval, through an application to the Board of Trade and then satisfying an auditor appointed by them, really points to the necessity of the special purposes fund and a professional auditor going together in a company, in order to facilitate matters in connection with the clause. We are entirely favourable to professional and specialized auditors for gas companies' accounts. With such men, there would be no difficulty in obtaining approval to all reasonable charges; but it seems a distinctly peculiar arrangement to make a Board of Directors subservient to an auditor in the manner proposed.

Expenses that may be chargeable to the fund are those incurred by reason of accidents, strikes, or circumstances which due care and management could not have prevented, or expenses incurred in the replacement or removal of plant or works other than expenditure requisite for maintenance and renewal of plant and works. There is a little ambiguity about this; and there should be elucidation by the authorities, in order that proper discrimination may be made as to what is replacement that may be charged, and as to what is maintenance and renewal which may not be charged. What off-hand we should imagine is intended is that the replacement of a portion of plant at the end of its life would be properly chargeable to the fund, but the expense of maintenance and renewal of parts during life will still, as heretofore, be a charge upon current revenue. It would be well, if the parliamentary authorities desire that their intentions shall be faithfully carried out in this respect, that they should redraft the clause in clearer terms.

One other objection is the latitude that the new clause gives in regard to the investment of this general purposes fund. The clause says that it may be applied to the general purposes of the company to which capital is properly applicable. That is a mistake. All such funds ought to be invested, outside the company, in securities easily realizable, so as to make the money immediately available for the purposes for which the fund is specially created. Invested in the capital of the undertaking concerned, it cannot be said to be available. Perchance, too, there may be administrators of gas undertakings, who, under the circumstances of this clause, will yield to the temptation to apply for power, under the guise of a general purposes fund, to draw from revenue, by 1 per cent. appropriations, up to 10 per cent. of the paid-up capital wholly and solely for the sake of the advantage to capital. This might benefit the gas undertaking financially, but the "general purposes fund" would only exist in name and not in substance.

Illumination Contracts and Tests.

WE can up to a point sympathize with those ardent spirits, such as Mr. J. S. Dow and Mr. Leon Gaster, who want to see "illumination" as a quality set on a higher pinnacle than it has been hitherto accorded, by fashioning for it specific laws, and giving to it the status of a commercial commodity. But sympathy and practicability do not companion each other in this matter; as the difficulties in the way are many, and appear to be insuperable. The application of approximately definite laws for illuminating interiors and exteriors is difficult enough under the variable conditions of situation and environment; but when one comes to inflict penalties upon the suppliers of gas or electricity on the verdict in those situations of any illumination measuring device (not an instrument measuring the power of the light source under well-defined conditions), then we say the ideal in these matters is being carried beyond the range of commonsense. But that is just what, as seen by a lecture elsewhere, Mr. Dow advocates. He treats his subject as though supplier and buyer were always different persons. So far as street lighting and the illumination of public buildings are concerned, they are not in all towns; and it is frequently found that the municipal suppliers of electricity are their own customers for electricity, but the customers of a company for gas. We have already seen how difficult it is, under these conditions of modern creation, to have the scales of justice held level and impartially between the two suppliers. The difficulty in this connection is so obvious as not to need any elaborate reference. Then another objection would be that, to be safe, the supplier of gas or electricity would (say, for street-lighting purposes) have to insist on the contract quantity of illumination being specified for every few yards length of a street, in order to make allowances for differences in conditions—favourable or otherwise to the source of light and to the suppliers of the illumination. Moreover, contracts based on illumination would necessitate, both for gas and for electricity, a complete reversal of the present conditions; the purveyor of gas or electricity would necessarily have to take charge right up to the point of the means of obtaining the illumination. That is another big objection to sale or contract with illumination as the basis of agreement or obligation.

It would, however, certainly be a considerable advantage if the electricity consumer could get greater protection in the matter of securing what he pays for. A gas consumer gets gas that is above a certain parliamentary standard illuminating power, and that complies with a specific standard of purity. But an electricity consumer has to put up with variable voltages and resulting illumination; and he has, in the majority of cases in this country, to deal with a department of an authority who alone could otherwise stand in the relation to him of legal protectors. There is an anomaly here that requires to be put right; and Mr. Dow and those who are enthusiastic with him should make this problem of the protection of the electricity consumer their very first thought We sell the consumer gas of a standard quality. It is for him to deal with that gas in the best way possible; and persistent are gas managements in bringing before their customers the best means for developing the highest efficiency from the gas. This being so, gas people would strongly object to be roped in with electricians by Mr. James Swinburne's charge

that the meter marks for most of them the boundary line of interest. The great difficulty is that there is no power to compel the consumer to adopt the best means of utilizing gas or electricity, nor to maintain in proper condition the means he uses. It is for this reason that, if purveyors of gas or electricity were to be bound to contract by a penalty test of illumination, the present conditions would have to be entirely changed, and full charge be given them right up to the point of the means by which the illumination is secured. That is an essential condition to such an ideal condition of things as Mr. Dow presents us with; and no gas or electricity purveyor wants much more responsibility than he has at present, if life is to be fairly tolerable. Furthermore, illuminometers have still their defects and their limitations; but this opens up too big a subject to discuss here. We will, however, say with a fair amount of confidence that, if Mr. Dow, and those associated with him, ask the central station electrical engineer what he thinks of being bound to an illumination contract by readings taken by these instruments, he would say things that would be more forcible than polite. He finds sufficient cause now for vexation in the complaints of fastidious consumers; to supplement these by an illuminometer being installed as arbiter in illumination contracts would make life much too burdensome for him.

Co-operation is asked for in further develcping the science of photometry. How much co-operation is desired by many among the electricians may be gathered by a reference to the paper that Mr. Paterson read, and the tone of the discussion on it, at meetings of the Institution of Electrical Engineers many months back. The foundation work of the past is trampled over by some electricians as something that is of little or no account; and there is a desire to pose as inventors and originators. Laudable that may be; but, in attempting to accomplish the desire, some really sound reasons should be advanced to justify stepping from those paths in which the greatest rectitude and the greatest amount of justice have hitherto been found. From the points of view of reliability and accuracy of the new instruments, what has been the degree of success which alone can show the justification?

Counsel for the Coal Owners.

An editorial article in the "Iron and Coal Trades Review," on "The Incidence of Coal Prices," contains certain sentiments with which we entirely and most cordially agree. "A consummation devoutly to be wished," writes our contemporary, "is that which would result from the general "adoption in the United Kingdom of a policy designed to "definitely and effectually harmonize the interests of the "producer and the consumer of coal." This expresses a wish shared by the owners of the gas undertakings of the country, who, with their millions of customers, would undoubtedly benefit by a definite and effectual harmonizing of interests in the manner suggested. It has been said over and over again—notably by Sir George Livesey, Mr. Corbet Woodall, and Mr. H. E. Jones, during this last period of excessive coal prices—that the gas industry would willingly suffer a normal price at a somewhat higher level than in the past if, by so doing, the upward flights of coal prices on the slenderest provocation could be avoided. This, we believe, fairly voices the general view of the gas industry. Coal is at the very base of the industry's manufacture and business; no less than, in round figures, 15 million tons being used annually and regularly for the manufacture of gas. When, therefore, prices take an upward leap, this hampers the industry in many and serious ways. On this last occasion of extremely high prices, an increase in the price of gas has, in numerous places, been necessitated, to the detriment of progress in the consumption of gas, and consequently of increase in the consumption of coal. Not only are high coal prices injurious to the development of the gas business, but in these days they carry in their train a considerably larger amount of costly labour than they did but a few years since, and what is more to be regretted a not inconsiderable amount of dissatisfaction among the poorer class of consumers. Gas undertakings nowadays boast that one-third, one-half, and even two-thirds of their consumers buy their gas through prepayment meters; and an increase in the price of gas means that every one of these prepayment meters, if there is a prospect of the higher price being continued for any length of time has to be adjusted to give a reduced quantity for a penny, and in many cases the consumers have to be placated with the hope that the higher price will not be of long duration. Then, when reduction takes place, the whole tedious process of meter readjustment has to be repeated. From all points of view, it would indeed be to the interests of gas manufacturers if a policy could be adopted that would "definitely and effectually harmonize "the interests of the producer and consumer of coal."

There are many truths in our contemporary's article, all of which would supply texts for quite a number of homilies for the special benefit of coal owners. For example, we are told that the well-being of the coal owner and the manufacturer respectively are by no means antagonistic as might at first sight seem to be the case—in fact, if we look below the surface, we shall find them to be actually identical, since the one great *desideratum* for a colliery is a steady reliable market, while an easily accessible and sufficient supply of coal is of the utmost importance to the manufacturer. This has the appearance of a confession on the part of this representative paper of the coal industry that the coal owners have not hitherto taken the trouble to look beneath the surface of things to find that material identity of interest which, one would have imagined, was plain, without very much mental exertion, to the meanest of intelligences. If we look at the events of the last two years, the question may be asked, and with some bitterness, as to who have been responsible for doing more than the coal owners themselves—by "com-"bination" and "understandings" and by inflating prices above a reasonable level—to foster antagonism throughout the length and the breadth of the country against the coal industry. "At the present moment," we read, "producer and "consumer both endeavour from their respective stand-"points to secure the best of the bargain, each taking full "benefit of any circumstance in his favour in existence for "the time being, without any regard to the consequences in "the near or more distant future." It would have been well if this statement had been penned—it would certainly have had greater applicability—at the time the coalowners were wrenching from the consumers of coal the utmost farthing, and not at the very tail-end of their extraordinary harvest. The reproach contained in the words "without any regard "to the consequences in the near or more distant future," attaches to the coal owners much more completely and neatly than to the coal consumer, whose potency in controlling coal prices is relatively infinitesimal to that of the coal owner, excepting perhaps when poor trade puts a keener edge on competition among the coal sellers.

The logic of the writer in our contemporary sadly lacks consecutiveness. Though "no regard is paid to the conse-"quences in the near or more distant future," yet, when the coal owners have made "the most" of their opportunity, "they have contributed to—nay, rather, have been the final "cause of bringing about, long years of depression in "industry, for their contracts at 'remunerative' figures "have precisely synchronized with a falling off in trade "generally." Here is a confession of shortsightedness in policy—a temporary fat harvest and long years of depression of industry, to which the coal owners have "contributed—"nay, rather, have been the final cause of bringing about." But our contemporary goes on to argue that it is during the periods of receding commercial activity that the mutual interests of producer and consumer become most apparent, for both classes of traders require concessions and assistance, which only the one can give to the other, and they can best meet the future by co-operation. Words, mere idle words. What inferences are we to draw from them? There is only one concession that industry at any time could give to the coal producer, and that is to concede a higher price; and such a concession is hardly possible during periods of "receding commercial activity." Whereas, accepting the authority of the "Iron and Coal Trades Review," the coal owners have it in their power to be, when they have the upper hand, a little less harsh, a little less contributory to, and not "the final cause" of bringing about, long years of depression for industry. Better far would it be to shorten those years and lighten the depression; and in the greater duration of activity of industry the coal owners would substantially share. Therefore, we are in full accord with our contemporary that the first aim of coal owners should be to avoid extreme fluctuations in price, since they are prejudicial to consumers who constitute the real backbone of the trade. "A consummation devoutly to be wished is," indeed, "that "which would result from the general adoption in the United "Kingdom of a policy designed to definitely and effectually "harmonize the interests of the producer and the consumer "of coal." The matter may be left at that, until the coal owners give consumers some earnest of their desire to bring

about conditions that would inure to their own advantage and that of the country generally. They may depend upon it that the gas industry would not be among the objectors to the promotion of such a rational state of affairs.

Gas Promotions.

We have been reminded that several gas companies have offices in Cannon Street, and that there have been promotions of gas undertakings from offices in Cannon Street other than those situated at No. 99. When we have in the past referred, and when we do henceforth refer, to Cannon Street gas promotions, if there should be any omission in specifying the number of the premises in Cannon Street, readers will please always understand that only one particular office is intended.

Good Management and its Reward.

Though one may be justified in supposing that managers of gas undertakings, as a rule, endorse in a general way the aphorism that "virtue is its own reward"—in other words, applying it to their own case, that the results of a year's good working are sufficiently gratifying to them apart from any extraneous recognition—we question whether there are not a few to whom the vote of thanks passed at the shareholders' meeting, or the acknowledgment made by chairmen of gas committees when the annual reports are presented, does not act as an encouragement and an incentive to increased efforts for the advance of the undertaking. When these testimonies to ability are accompanied by suggested additions to the remuneration of the official who has evoked them, it is only natural—though it may be regarding the matter from a purely mercenary standpoint—that they should be doubly gratifying. Apart from their individual application, they are, to an extent, a recognition of the principle of profit-sharing or co-partnership which is gradually being borne in upon owners of industrial undertakings. We have recently been pleased to record two instances of justly deserved advances in the salaries of gas managers; and the only reason for calling attention to them here is to express regret that they were not both granted with equal readiness. In the case of Mr. Naylor, at Rotherham, during his three years' connection with the undertaking the consumers have increased by 800, and the sales of gas by 51 million cubic feet, while the leakage has been reduced from 12·5 to 8·3 per cent. At the lowest selling price of gas (1s. 6d. per 1000 cubic feet), this represents £780 per annum. Alderman Gummer, the Chairman of the Gas Committee, warmly commended to the Council a recommendation by the Committee to increase the Gas Engineer's salary by £100, in two annual instalments; and not a single voice was raised—not even by a Labour member—against what a local paper characterized as "the Corporation only dealing justice to one of their officials." Less satisfactory was the attitude of certain members of the Teignmouth District Council in regard to a recommendation by the Gas Committee to grant a small addition to the salary of their Manager. Not only did the Chairman of the Committee speak in appreciative terms of Mr. Gray's work, but expressed disappointment that the amount offered to him was not more liberal. He reminded the Council that prior to the engagement of the present Manager the gas-works were carried on at a loss; whereas now the consumers have cheaper gas and there is a profit balance. This year, for the first time, the gas undertaking has been independent of the district rate, and a reduction of 2d. per 1000 cubic feet will take effect in a few weeks, thanks mainly to the better management; and the fact has drawn an expression of high appreciation from the local Ratepayers' Association. Yet there were those in the Council who would not acknowledge, much less give tangible proof of their recognition of, the ability of the official who had brought about the improved conditions. Fortunately, for the credit of Teignmouth, they were but three.

The "Proceedings" of the American Gas Institute.—We have received the second volume of the "Proceedings" of the American Gas Institute, containing the papers read at the annual meeting held at the New Willard Hotel, Washington (D.C.), in October last, under the presidency of Mr. Walton Clark, with the discussions thereon, the answers sent out to the practical class of the Institute, the contributions to the "Wrinkle Department," &c. The volume is a very bulky one, extending, with the lists of members, to 1110 octavo pages; and an effective portrait of the President is given as a frontispiece.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 458.)

THE Stock Exchange had a much better time last week, aided largely by the same influences as have lately been the factors of improvement—viz., money and the American Market. But the volume of business might well have been more ample in order to be thoroughly gratifying. The opening was decidedly shy; being a little timid after the drop the preceding week. Consols were flat; and they set a bad tone. But soon a recovery set in, inspired by Transatlantic and Continental advices; and most of the fall was regained. Tuesday was quite cheerful; and the fortnightly account had no terrors. The brighter view of things prevailed through Wednesday, and prices improved somewhat; but the enthusiasm was not sufficient to stimulate very active business. Thursday was not quite so good, perhaps owing in some measure to the weather; and the gilt-edged division was dull, though the rest held up. On Friday, the positions were just reversed; Consols rising, while the other markets were easier on realization to secure profits. Saturday was a quiet day, with a few slight ups and downs. Things were, however, mostly steady and unchanged. The Money Market was for some days in the very easy condition which had characterized the previous week; but later on it steadied, and promised to be firmer. Business in the Gas Market showed no disposition to increase in volume, and on some days it was quiet to a marked degree. But it showed not the least tendency to depression for lack of support. In the Provinces, indeed, several advances in quotation were effected by high-class issues. In Gaslight and Coke, the ordinary was a little quieter, but unimpaired in strength. An exceptional amount was marked specially at 94¼; but all other transactions were at from 94½ to 95¼—the same limits as in the preceding week. The secured issues were firm and unchanged. The maximum changed hands at from 88½ to 90, the preference at 107¾, and the debenture at from 83½ to 85. In South Metropolitan, there was moderate business at the old quotations; dealings being marked at from 118½ to 119½. Hardly anything was done in Commercials. One bargain in the 4 per cent. at 107, one in the 3½ per cent. at 102, and one in the debenture at 82½ free was the total. The Suburban and Provincial group was little dealt in. Brentford old was a point lower, at 241½ and 241. Bromley "A" was done at 118¾ and 119, Tottenham "B" at from 104½ to 105¼ (a rise of 1), and West Ham at 101 and 101¼. Liverpool, Newcastle, and Southampton advanced, and Chester had a big rise, with business marked at 112¼. The Continental Companies were very quiet. Imperial marked from 179½ to 180¾ *cum div.*, and 176½ *ex div.*, ditto debenture 93¾ and 94, European fully-paid 23, and Tuscan 10⅝. In the undertakings of the remoter world, Buenos Ayres was done at 11⅛, Monte Video at 11½, Primitiva preference at from 4⅞ to 5, ditto debenture at 94½, River Plate at 13 and 13 1/16, San Paulo at 13¾, and Oriental at 142½.

ELECTRICITY SUPPLY MEMORANDA.

Voluntary and Involuntary Reductions of the Average Price Per Unit—Automatic Decline in the Average—Complicated Charging—The Disadvantages of Metallic Filaments—Anti-Vibrators for Electric Lamps—Competition in Electricity.

THERE is a vast difference between voluntary and involuntary reductions of the average price received per unit for electricity. In the case of voluntary reductions, an approximate calculation of what is being conceded can be made by the administrators of the undertaking concerned; but, under the conditions with which the electricity industry has surrounded itself, there is an involuntary form of reduction of average price going on, and at a pace that was completely unanticipated, and which is for many undertakings somewhat disconcerting. The established conditions which have brought about this state of affairs are being attributed to "misunderstanding" by such authorities as Mr. Robert Hammond now that other conditions have interposed themselves which show the folly of having a scale of charges with 4d., 5d., 6d., or 7d. per unit at one end for one class of business, and 1d., or fractions of 1d., at the other for another class of business. The financial records of the Charing Cross (West End and City) Electricity Supply Company well illustrate this. "Chesterfield Junior," in the "Electrical Times" suggests that the accounts of the Company for the past year are in many respects the most satisfactory that they have yet produced. "Of course," he adds, "it cannot be pretended that from a purely financial point of view, they reach the standard of the Company's 10 per cent. dividend days. The value of the dividend, however, is not the only basis upon which the merits of an electric supply undertaking are to be appraised. The rate which the undertaking charges for its supply is not less important." This is writing round about the question; for there is no merit attaching to the management in the fact that the reduction of the average rate of charge is going on apace through the development, at a fairly rapid stride, of the use of electricity for those purposes for which the price per unit is extremely low, while the development of use for the purpose for which the price is considerably higher is proceeding at a much slower price. So

there comes about a declension of the average income per unit at a rate not premeditated by the Directors; and thus what we have described as the involuntary reduction of the average rate ensues. We do not believe this or any of the other electricity companies who have suffered a drop in dividend would have taken to the line of policy that they did had they realized that the dividend would have been affected in the manner seen in the case of the Charing Cross Company, and of which strong complaint has been made by shareholders at the meetings.

The automatic decline in the average rate received by the Charing Cross Company is the experience of other of the large concerns supplying in London; the figures of all show a material difference compared with those of half-a-dozen years back. The decline, declares "Chesterfield Junior," has been persistent all round; and the effect which this exerts upon the dividend distributions may be illustrated from the Charing Cross figures. To-day, the Company—taking the average price—get for each unit of electric energy delivered to their consumers only about two-thirds of the price realized five years ago; the reduction being equivalent to about 1d. per unit. Upon last year's output, it is calculated by this investigator of electrical finance and working that an additional 1d. per unit would have meant almost £80,000, or another 3 per cent. yield of gross profit, which would have brought a full 10 per cent. ordinary dividend, together with a substantial depreciation rate, well within the compass of the undertaking. As it is, the ordinary dividend reached 5 per cent., but the depreciation rate had to be severely restricted. It would be instructive if "Chesterfield Junior" would write a little more fully on the subject of the causes of, and the remedy for, the decline. On the very same page of the "Electrical Times," we find that the Northampton Company have not been so successful as the previous year. Again we read that the gross profit is "only a trifle less;" but that "trifle less" is on a larger output of electricity, and the yield on the capital has fallen from 6·42 per cent. to 6·07 per cent. The decrease in profits is due to a decline in the average receipts. Now it should be remarked that these persistent declines have preceded the introduction of the higher efficiency lamps; and therefore it will be interesting to see what effect this new development will have in depressing the consumption of the expensive units of electricity at the one end of the scale, and giving greater and greater proportion to the consumption of the low-priced units at the other end.

It is inevitable that price revision is what many undertakings will have to resort to, though such a course may not be to their liking. Northampton, it is seen, has adopted the Norwich system of charging for domestic supply (perhaps it was Norwich that adopted the Northampton system), whereby a fixed sum is charged according to the rateable value of the premises in which electricity is used, *plus* a small charge per unit of electricity consumed. We do not know why we should hope that, while a revision of the basis of charging is going on among electricity undertakings, they should adopt more rational systems of doing business, as the complications they have introduced in the past and their wanderings from the straight paths in commercial transaction, have undoubtedly been to the advantage of the gas industry. But there is something objectionable in seeing even rivals making such a muddle of the commercial part of their business as the administrations of many electricity undertakings have done. West Ham has often been held up as an imitable example of electrical progressivism. Lurid is the state of affairs in that direction to-day. But we are on the subject of charge revision; and while this is proceeding, confusion should certainly give place to simplification. This is how the Wednesbury Electricity Department consider they have succeeded in producing simplification. A revised scheme of charges that has just lately been issued comprises flat-rates, with and without special agreements, two alternative maximum demand rates, special flat-rates for continuous use, restricted and unrestricted use (power) rates with discounts, special agreement rates based on power demand, also special terms for combined lighting and power consumers. Our old friends of the "Electrical Review" have had a little tilt at these optional variations; and it is a nasty hit to suggest that the people of Wednesbury will want a day or two's freedom from ordinary business cares in order that they may bestow their undivided attention upon this scale of charges. But while this sort of thing goes on in Wednesbury, the better is it for the Birmingham Corporation gas undertaking, who sell to the consumer 1000 cubic feet of gas at a level charge, and that a moderate one.

It is quite right that those electricians who are satisfied that the metallic filament lamp is going to deal them an ugly blow financially, should lighten the blow as much as possible by publishing, as they are found out, the disadvantages of the new lamps. One of our electrical contemporaries has been summing up the disadvantages; and we suggest that the article should be circularized by those managements of undertakings who are disturbed over the possible undermining of their solvency by the newcomers. If this suggestion is acted upon, the consumer who is contemplating changing his lamps will read that some of the most efficient of the new ones have brittle filaments, which are apt to put them out of commission at unexpected and awkward times; that some of the lamps cannot be hung at the smallest angle from the vertical; that most electricity systems are not laid out for the most economical use of these lamps; that makeshifts and expedients are therefore necessary; that with (for example) the tantalum lamps, it is necessary to take pairs of points in the wiring of houses, and so manipulate the connections that two lamps are placed in series, instead of parallel; that there is the cost of alterations, and the initial cost of the lamps to consider; and that there is trouble with regard to maintenance. Going on, the consumer will have explained to him that it has been found, from experience, that it does not do to put a new tantalum in series with one that has been burning for a considerable number of hours—in other words, it is necessary to pair-off lamps with due regard to the potential difference between the terminals of each lamp. That should "do him in;" but, if not, then perchance success will be achieved when he learns that the potential difference is accentuated in the case of lamps having a still smaller voltage. The restriction to vertical fixing of certain of the lamps he will also learn is rather irksome. Also that to get over the low-voltage difficulty, the use of transformers does not invariably tend to an overall economy of the installation, more especially when the transformers are constructed to deal with anything under (say) ten lamps. The iron and copper losses of such apparatus militate against the economy in energy obtained by using the newer type of lamps. What could be better? Those engineers who are trembling for the future financial security of their undertakings through the use of these new lamps would cause the evil to work its way very slowly by carrying out our suggestion that the article, the points of which we have picked out here, should be distributed among consumers and householders. Few consumers would dare to put in lamps around which cluster such a mass of disadvantage.

The brittleness of the metallic filaments is spoken of in the former paragraph. Already there is a suggestion out for the use of an anti-vibrator for such lamps—just in the same way as anti-vibrators came into use for incandescent gas mantles where they were subject to excessive or constant vibration. An illustration before us shows an anti-vibrator with a strong family likeness to these gas-burner anti-vibrators. The device consists of a pair of springs, to the ends of which two insulated hooks are attached. These hooks are passed between the turns of the flex, leaving a loose piece carrying no weight. The difficulty is to get the metallic filament lamps into position without damaging the filaments. It is the complaint of retail dealers in these lamps that large numbers reach them unfit for use, through having been permanently injured in transit.

In small districts, without any considerable outlets for custom, electricity ventures by municipalities have not been strikingly lucrative; and the Local Government Board have been lately withholding their permission to schemes where they are of opinion that the undertakings would impose a loss on the ratepayers. It is, of course, unfair to the poorer ratepayers, and, in fact, to all ratepayers who do not desire to patronize electricity, that they should have foisted upon them a concern that, from the custom available, does not pay its way. It is frequently found that a majority of a municipal authority are tradesmen with premises in main roads. They take a fancy to having electricity for their shops and for lighting the main streets where their shops are situated; and for this expensive street lighting, the whole of the ratepayers have to pay, as well as meet any loss that ensues through the undertaking being unable to satisfy from its own resources all its liabilities. The recent attitude of the Local Government Board in the matter is to be commended, so long as they stick to it, and do not allow themselves to be blown about by the winds of private influence. Disappointed municipalities, however, get their local Members of Parliament to intercede for them with the President of the Local Government Board; and then follows some change of decision. We do not know that this is what has happened at Wednesbury. May be it is; may be it is not. The town has been supplied by the Corporation with electricity purchased in bulk from the Midland Electric Corporation; but the business has been a losing one. The Town Council thought, though the days of miracles are passed, they could do better if they had a generating plant of their own. Therefore, an application to the Local Government Board for a loan of £10,000. The Board hesitated, and declined. Suddenly comes the news that a loan of a little over £7000 has, after all, been granted, and at the same time that the Midland Company intend to exercise their powers of supply in the town. What hope is there of either system paying there? The Midland Electric Corporation are much the stronger of the two; and we foresee the municipal undertaking going to the wall if events shape themselves as is expected in the direction of competition. The Council will have their liabilities to meet. The ratepayers of the town are not to be envied their choice of administrators, nor the loss in store for them. The history of gas supply does not favour competition; and Parliament does not allow competitive schemes.

At the *conversazione* of the Royal Society last Wednesday, Professors H. L. Callendar and W. E. Dalby showed a large number of optical diagrams from gas-engines; but of greater interest was an apparatus for measuring temperature in various parts of gas-engine cylinders. It consisted of a platinum wire of 0·001 inch diameter, held in a shield, and pushed into the cylinder through the centre of the exhaust-valve, by a cam, at any part of the stroke. A contact-maker driven by the lay-shaft momentarily closed a circuit through the wire, and enabled its resistance, and therefore its temperature, to be noted at any desired moment. The inventors are confident that the apparatus can be relied upon to give results within half-a-degree when used for measuring cylinder temperatures.

PRESENTATION TO MR. FRANK BUSH.

On Wednesday last, Sir George Livesey presided over a meeting of officers convened for the purpose of presenting a Sheraton "Grandfather" clock to Mr. Frank Bush, the late Secretary, who is now one of the Directors of the South Metropolitan Gas Company.

In opening the proceedings, Sir George spoke of the impossibility of the Directors having a personal knowledge of the staff and workmen, and said it was most important that the Secretary should be a man who would deal justly and considerately with his subordinates. In Mr. Bush they had a man whom they felt was under any circumstances their friend. During the 26 years of Mr. Bush's secretaryship, many young men had been indebted to him for kind words and help towards advancement in the Company. There was a feeling of comradeship among the staff and workmen which was very pleasing to the Directors, and which one could not but attribute to the principles of co-partnership which united them in the bond of common interest and common work. The divine rule as to the duties of man to man was a very clear and simple one and applied to all circumstances. Mr. Bush had worked in the spirit of that rule, and their gift was the outcome of a spirit of affection and an overflowing heart towards him.

The presentation was then made; and an address with over five hundred signatures was handed to Mr. Bush.

In acknowledging the gift, Mr. Bush said he had been overwhelmed with kindness from his brother officers; and this present was another indication of their kind partiality to him. He had accepted a seat on the Board at the unanimous desire of the Directors, and he prized the position very much. If by honourable and just dealing, and by being fair and sympathetic, he had gained the esteem of the staff, he was more than satisfied. Mr. Bush concluded with a few words of advice to the younger members of the staff.

After some remarks by Mr. Robert Morton (one of the Directors) and Mr. H. C. Sims (the Chief Accountant), who said that the pleasantest episode in his business life had been his association with Mr. Bush, Sir George Livesey closed the proceedings, remarking that he had seldom spent such a pleasant hour as the one just ended.

The proceedings were marked with a cordiality and an enthusiasm which bore eloquent testimony to the universal esteem in which Mr. Bush has always been held.

On April 22, the occasion of the opening of the Livesey Institute, Mr. Bush was presented with an illuminated address from the workmen of the Company at all stations. Mr. H. T. Manley (one of the Employee Directors), in making the presentation, spoke of the esteem in which Mr. Bush was held by employees of all ranks; and hearty cheers for Mr. and Mrs. Bush were raised by the nine hundred men crowded in the room. Sir George Livesey, who presided, bore testimony to the cordial relations between Mr. Bush and the employees.

THE RETIREMENT OF MR. HENRY HACK.

In the "Journal" last week (p. 349), reference was made to the above subject. We now learn that at a meeting of the Gas-Works Sub-Committee the previous Friday, the members took leave of Mr. Hack, who, it was mentioned, was going away from Birmingham for a short holiday prior to his retirement on the 29th inst., when, under the rules of the Birmingham Corporation Superannuation Scheme, he is required, having attained the age of 65 years, to relinquish his office of Engineer-in-Chief.

In referring to the matter, Alderman Bishop, the Chairman of the Sub-Committee, said they had that day to take farewell of Mr. Hack, whom he personally had known for thirty years—from within two years of the acquisition of the gas undertaking by the Corporation. The resolution he was proposing really expressed all that could be said of Mr. Hack; and his only complaint, if he might so term it, was that he might have left more work for others to do. But he had always given of his best, and had placed the interest of the Gas Department first. He had pleasure in submitting the following resolution:—

> That this Committee place on record their high appreciation of the able, faithful, and strenuous services rendered by the Engineer-in-Chief, Mr. Henry Hack, during his 36 years' connection with the Birmingham gas undertaking; and they desire to express the hope that he may be long spared and have health to enjoy the period of retirement he has so well earned.

Sir Hallewell Rogers expressed his great disappointment at Mr. Hack not being able to accept his invitation to meet the Lord Mayor and past and present members of the Gas Committee at luncheon. He did not purpose saying much on this occasion as, having regard to Mr. Hack's state of health, it would be unkind to do so. The Committee knew, as Alderman Bishop had said, that Mr. Hack had always given them of his best. He was sorry Mr. Hack had not been well lately, but he hoped he would soon be restored, now that he had some leisure. Alderman Lloyd and Councillors Toller and Barrow also added expressions of esteem for Mr. Hack, and their best wishes for him in his retirement.

Mr. Hack, in reply, thanked the Committee for the very kind remarks that had been made concerning himself. He said it had given him great pain to have to decline Sir Hallewell's invitation; but he was acting under the advice of his doctor. He could only repeat his regret that this was so, and express his thanks for the kind consideration which had been shown to him. He was sorry to learn from his medical adviser that his complaint had returned; but he hoped, with care, to recover his health. He felt that during the time he had been with the Gas Department he had always done his best for the Committee. He hoped the success of the undertaking would be continued, and that it would be even greater in the future than it had been in the past.

THE FRANCO-BRITISH EXHIBITION.

We are asked to advise those readers of the "Journal" who will be specially visiting the Exhibition to inspect the Gas Engineering Section (fully described elsewhere to-day, p. 424) to defer their visit for at least a fortnight, so that the whole display may be seen in something like complete form.

The Guarantee Fund for the Section.

We have received from Mr. James W. Helps, the Hon. Secretary of the Committee having charge of the arrangements for the Gas Engineering Section of the exhibition, the following further list of contributions promised to the guarantee fund:—

	£	s.	d.
Companies.			
Cheltenham	21	0	0
Eastbourne	10	10	0
Enfield	10	10	0
Hastings	10	10	0
Weston-super-Mare	10	10	0
Maidstone	7	7	0
Elland	5	5	0
Exeter	5	5	0
Kidderminster	5	5	0
Rushden	3	3	0
Spennymoor and Tudhoe	3	3	0
Taunton	3	3	0
Exmouth	2	2	0
High Wycombe	2	2	0
Newmarket	2	2	0
Corporations.			
Salford	20	0	0
Widnes	5	0	0
	126	17	0
Amount previously acknowledged	3821	1	0
	£3947	18	0

PERSONAL.

We learn that Mr. C. F. Broadhead, an assistant at the Basford station of the Nottingham Corporation, has been appointed Engineer and Manager of the Middleton Corporation Gas-Works, in succession to Mr. J. Carter Moon, who, as already announced in the "Journal," has obtained a similar position at Vancouver. Mr. Moon was recently presented with a gold watch by the employees, as a mark of their esteem for him.

Mr. Andrew Wilson, the Deputy Gas Engineer and Manager to the Bradford Corporation, has been appointed Deputy Gas Engineer to the Australian Gas Company of Sydney. Mr. Wilson is a son of Mr. Thomas Wilson, of Coatbridge, under whom he gained his first insight into gas engineering. He was next engaged at the Barrowfield Iron-Works, Glasgow, and was subsequently employed under the City Analyst (Mr. R. R. Tatlock). He was then appointed Assistant to Mr. Joseph Hepworth at Carlisle, and after being with him for two years he obtained the position of Gas Engineer and Manager at Perth, which he held for four-and-a-half years. He then went to Bradford, and during his service there the Corporation have acquired four local Companies, and thereby increased the number of their manufacturing stations to eight. Mr. Wilson expects to leave England for Sydney about the 12th prox.

On the occasion of the meeting of the Institution of Mining Engineers in London early next month, the members will be afforded an opportunity of inspecting the tar-works of the South Metropolitan Gas Company at Ordnance Wharf, East Greenwich. The morning of the 6th prox. has been fixed for the visit, and 9.18 a.m. for starting from the Charing Cross terminus. On reaching the works, the party will be received by the Manager (Mr. S. S. Field), under whose supervision they will inspect the establishment, the chief features of which include the continuous distillation of coal tar, its use as a fuel, and the mechanical appliances employed in loading steamers with pitch, &c.

A "SPECIAL PURPOSES FUND" IN GAS ACTS.

Text of a New Clause.

THE authorities of the Houses of Parliament have prepared yet another new clause, which they are putting forward for insertion in the various Gas Bills now pending.

This time it is a provision intended as a substitute for the ordinary insurance and renewal fund clauses, and has already made its appearance in the Swinton and Mexborough Gas Bill as introduced into the Second House. The clause (which is given below) as will be seen, makes provision for the creation of a "Special Purposes Fund," by apparently the blending of what has hitherto been regarded as the two separate funds named. And inasmuch as the moneys which constitute the funds in question are only applicable to purposes of a special and extraordinary nature, there certainly seems no reason why one common fund should not meet the case—it will simplify matters for gas companies, if it does nothing else. The only material alteration which has taken place in the process of amalgamation lies in the fact that the amount of the insurance fund was ordinarily limited to one-twentieth part of the paid-up capital of the company and the renewals fund to one-tenth, whereas the maximum amount of the special purposes fund is one-tenth of such capital.

Power to Create a Special Purposes Fund.

(1) The directors of the company may, if they think fit, in any year appropriate out of the revenue of the company, as part of the expenditure on revenue account, any sum not exceeding an amount equal to one per centum of the paid-up capital of the company, including premiums, to a fund to be called the "Special Purposes Fund."

(2) The special purposes fund shall be applicable only to meet such charges as a chartered accountant, or incorporated accountant, being the auditor of the company, or appointed for the purpose by the Board of Trade, shall approve as being—

(*a*) Expenses incurred by reason of accidents, strikes, or circumstances which due care and management could not have prevented; or

(*b*) Expenses incurred in the replacement or removal of plant or works, other than expenses requisite for maintenance and renewal of plant and works.

(3) The maximum amount standing to the credit of the special purposes fund shall not at any time exceed an amount equal to one-tenth part of the paid-up capital of the company, including premiums.

(4) The moneys forming the special purposes fund, or any portion thereof, may be invested in securities in which trustees are authorized by law to invest, or may be applied for the general purposes of the company to which capital is properly applicable, or may be used partly in the one way and partly in the other.

(5) Resort may from time to time be had to the special purposes fund, notwithstanding that the sum standing to the credit of the fund is, for the time being, less than the maximum allowed by this section.

LIGHT AND ITS EFFECT UPON THE EYE.

IT is generally recognized that the eye, which may be seriously injured by Nature's own bright sunlight, is also easily affected by the much less brilliant light produced by man. The two chief factors in both natural and artificial light are brilliancy and actinism. The increasing use of light sources of various intrinsic brilliancies and different proportions of chemical rays renders the subject of practical, and at the same time physiologically correct, illumination exceedingly difficult to the lighting expert, who has regard both to efficiency and to hygiene. Close pursuit of the former may involve some neglect of the latter; for the two do not appear as yet to be altogether compatible.

The possibility, however, of considering both economy and ocular physical comfort obviously varies with different light sources and methods; and it can be easily understood that to those engaged in general illumination problems all information that is procurable on the subject is valuable and welcome. The questions of efficiency and economy are not so difficult to settle. Various writers have from time to time discussed the general effect of light upon the eye; and within the last year or two even greater attention has been paid to the question. So far, the data available are not conclusive on a number of points. But the ground has been somewhat cleared by the process of elimination; and those lighting engineers who have regard to human eyesight can, to some little extent, limit their choice of light sources to certain fairly safe types. Putting aside for the moment the question of excessive intrinsic brilliancy, the disadvantage of light sources containing a large proportion of violet and ultra-violet rays, is becoming generally known—so much so, indeed, that attention is being increasingly paid to devices intended to reduce the trouble. Some mention was made in the "JOURNAL" for March 31 last, p. 829, of the work of Herren Schanz and Stockhausen, who, coming to the conclusion that eye troubles were in part caused by these rays, recommended the use of special lamp glasses made to prevent their passage. Other investigators, agreed as to the danger due to the ultra-violet rays and the violet end of the spectrum, and more or less in accord as to the effect of other parts of the spectrum, are fairly unanimous in declaring for yellow light as being the least harmful. This opinion is regarded, indeed, as so well founded that further suggestions follow, based on the possibility of making for light sources glass shades permeable principally to rays of the central part of the spectrum.

The whole question is full of considerable interest in every way, and not merely of interest, but of importance, in view of the ever increasing demand for light. As expressed by Dr. Kennelly, of the Illuminating Engineering Society, one of the most extraordinary changes which modern civilization has brought about has been in regard to the intensity of illumination and the total quantity of artificial light which is employed. The average foot-candle illumination in buildings two or three centuries ago must have been microscopic in comparison with that now ordinarily in use. This change necessarily brings about conditions for which the human system may or may not be prepared; and it would appear that in respect to vision, adaptation is not altogether easily possible. So far as the effects of light upon eyesight is concerned, the Illuminating Engineering Society have on several occasions usefully discussed various phases of the subject; and recently the question has again been dealt with in a valuable paper by Dr. H. H. Seabrook, delivered before the New England and Chicago Sections of the Society. Dr. Seabrook in his contribution describes the structure of the eye, and then refers to the natural defences it possesses against such a powerful destructive agent as light. These are partial or complete closure of the eyelids, the action of the iris in closing the pupil, and the frequent movement of the eyeball preventing too long an exposure of any one portion of the retina to white or coloured light. The human lens absorbs spectral light at the H line, and absorption is complete at L or M.

Discussing various investigations on the effect of ultra-violet rays, the author refers to Birsch-Hirschfeld's work in 1904, stating that certain things seem worthy of mention. With a current of 3 to 4½ ampères from a Finsen lamp (the iron being cooled by water, so that the lamp was not hot to the skin), chemical changes were produced in eyes in 4 or 5 minutes. These were a certain puffiness and change of colour of the anterior coats except the cornea, with slight cloudiness of the cornea and shedding of cells covering its posterior surface, and congestion and discoloration of the iris; the layer of cells lining the anterior capsule of the lens also showing injury. Inflammation followed in from twelve to twenty-four hours after exposure, and subsided in four or five days, although eyes were not normal for four or five weeks, even when they escaped permanent damage. The protection from the lens varied greatly in different individuals. Exposure to ultra-violet rays caused damage to the ganglion cells of the retina in half-an-hour to an hour in eyes without the lens, and with a longer exposure in eyes retaining the lens. With repeated exposures, even if the chemical light was not intense, cataract would be formed. This opacity of the lens would then be permanent. Spectral rays of sufficient intensity cause damage; but the blue rays, and still more the violet ones, are the really harmful ones. Disintegration and dissociation of the cells in the pigment layer, occurring from exposure to light, are at a minimum in yellow light. A natural suspicion that heat rays cause damage to the eyes has never been really confirmed. Discomfort may perhaps be caused by them; but no tissue changes.

The severe injuries to the eyes from light already mentioned have but little practical bearing upon the work of illuminating engineers, since no one expects the demand for brilliant light in large areas to be ignored; and protection can be obtained by frequent changes in the position of the eyes with their consequent rest. Illumination for near work, however, is in a most unsatisfactory state. America leads the world apparently in the brilliancy of its artificial illumination, and certainly in ocular exhaustion, discomfort, and congestion. These troubles began to increase when gas came into general use, with a further increase on the advent of incandescent electric lamps. The author quotes various analyses indicating the relative proportions of violet rays in the light of the sun, the arc, gas, and acetylene; then, waiving the violet-ray question so far as the electric incandescent lamp is concerned, he looks for the contributory causes which make the latter responsible for more chronic eye degeneration and disturbance than any other light used for near work. Reference is made to the concentrated light of the filament as being more harmful than the diffused light from flames. The light, too, is more steadily brilliant than kerosene, gas, or the gas-mantle burner; and there is, therefore, less chance for retinal recuperation. Ground glass globes afford benefit by diffusing the light; and they reduce all the rays of the light by about 25 per cent. The incandescent electric lamp is usually badly placed; so that either the eyes are subject to direct light, or the head must be bent forward for work, congesting the eyes. Green on a tin shade will not correct this trouble. Again, there is disadvantage in the thinness of the glass bulb of the lamp, since chemical rays are absorbed by glass in proportion to its thickness.

In discussing glass in relation to high intrinsic brightness, Dr. Seabrook gives yellow, and preferably amber yellow, as the colour for the conservation of vision and protection of the eyes from the chemical action of light. This colour may be darkened by a brown admixture for weak or diseased eyes, or for unusual light exposure.

It is difficult to manufacture without imperfections and the supply slowly follows the demand. Nothing is said as to the resultant obscuration of light by the using of tinted glass; the Doctor apparently preferring to deal with the subject from the purely physiological aspect. He evidently thinks that some such tinted glass protection is very much needed for the glow lamp; for he says that if the blue and violet rays of the spectra of daylight, kerosene, argand, Welsbach, and incandescent electric lamps are cut off by varying shades of amber yellow glass it will be found that the kerosene burner (previously described as the most harmless of lights) is at one end of the list, and the incandescent filament at the other. Very little is said about gaseous illuminants. The one reference to the Welsbach burner is that in this the ordinary gas-flame, with its marked excess of red, is changed to a cold light deficient in that colour. It is less irritating to some eyes than other lights, but more irritating to others. In the concluding part of the paper, the author summarizes his points as follows: Lights weak in chemical rays are better suited to the eyes than others; present lights may be improved by attention to position, including the distance of the source of light from the eyes as measured by the course of the rays; and protection of eyes by glass properly coloured.

Interesting comments followed the delivery of the paper, both at the New England and Chicago meetings. Taking them together, it may be said that the discussion dealt principally with the injury that is caused by the preponderance of chemical rays. While agreeing as to such trouble, some speakers questioned whether, apart from results obtained in experimental tests, these rays, as given by modern illuminants, caused any marked injury under the conditions of general use. Dr. Louis Bell, for instance, stated that the eye receives a maximum of impression with a minimum of energy from the yellow or bright part of the spectrum, and the recovery from the exertion of seeing is made with the least recuperative effort when the light comes from this central region. The luminous stimulus in the ultra-violet and blue, as in the extreme red, is remarkably weak; and in view of these facts, there is adequate reason for the effectiveness of amber glass in shielding the eye by softening the light without introducing any hypothesis whatever, as to the probable value in cutting off the blue as such. There is no reason to believe that the ultra-violet rays, unless very intense, were particularly dangerous, since daylight is richer in its proportion of blue and ultra-violet radiation than any artificial light, save the quartz mercury arc or the Finsen lamp. Dr. Seabrook, in his reply, said in his investigations he had not found that the modified light on the north side of a house (taken as Helmholtz' standard of daylight) was as rich in chemical rays as even the light from a gas-lamp. He was inclined to insist on modified daylight for standard purposes.

Dr. Bell further remarked that the central and most luminous rays of the spectrum should be most satisfactory for seeing purposes; but these may not be used *ad lib.* without some risk. The light from some of the glowing arcs, for example, unless softened, may produce disastrous results. The mischief is largely due to concentration of the energy to which the retina is most sensitive. Speaking on this point, Dr. Bell referred to the intrinsic brilliancy of the new incandescent lamps as being very high, and said that it should be modified. At the expense of some 30 or 40 per cent., this could be reduced to a brilliancy below that of the kerosene lamp; and when this was done, the chief cause of difficulty, though not all subsidiary causes, would be removed. Dr. A. E. Kennelly—gathering from the paper that red rays, which are of relatively low frequency, are not, and violet or relatively high frequency rays are, physiologically dangerous—suggested that there was no information forthcoming as to the relative physiological influence of the intermediate rays of the spectrum, orange, yellow, and green. It seemed reasonable to suppose that though not so injurious as the violet, these intermediate rays are hurtful when they fall on the retina beyond a certain degree of intensity. He endorsed Dr. Seabrook's plea for the protection of the eye from unnecessary stimulus of any colour, and particularly of the violet; but in the absence of physiological evidence as to the safety of yellow, green, and blue light, he should not consider injury to the eyes was attributable exclusively to violet rays. Whatever may have been the troubles due to the intermediate rays, several other speakers spoke unhesitatingly of their personal experience of bad effects from the violet rays of arc lamps.

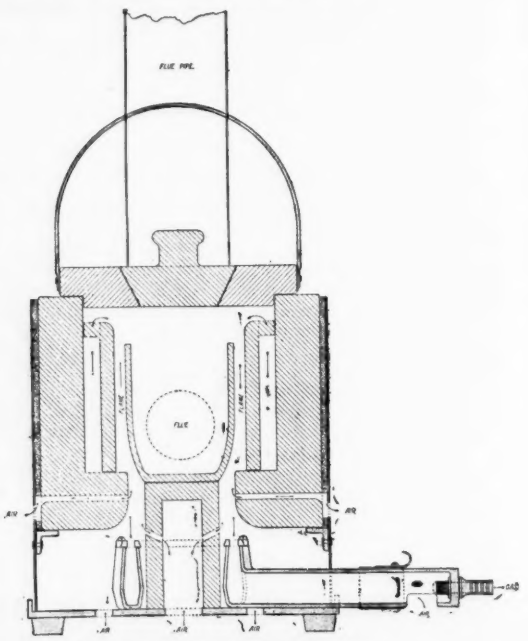
Mr. E. L. Elliott emphasized the fact that the new and more efficient light sources now coming into such general use create for the illuminating engineer and the manufacturer a new problem—that of discovering a method of modifying the light from these sources so as to reduce or eliminate the elements of danger. Heretofore the single use of a globe was to soften, to reflect, or to diffuse the light; but with light sources rich in harmful rays, the question of the lamp covering must involve a study of the absorption of the dangerous rays. The possibility of making glass that will absorb the dangerous blue, violet, and ultra-violet rays is a matter which has almost been neglected, though he saw no theoretical reason why such glass should not be made.

A pertinent question was asked by Mr. Walton Clark—whether it would not serve the purpose about as well to diminish intrinsic brilliancy in order to protect tired eyes, as to adopt the elaborate method of cutting off certain colour rays by amber-coloured shades or glass. This indirect suggestion of eliminating light sources of abnormally high intrinsic brilliancy, thus avoiding the necessity of reduction and waste by partial shading, was not followed up.

THE INDUSTRIAL USES OF GAS.

When we consider the multifarious industrial work—on the large scale of manufacture down to the small home scale—in which heat is required, there seem to be great possibilities in this direction for developing the day side of the gas business. The uses may be individually comparatively small, but they are unlike, for instance, the intermittent and remarkably simultaneous employment in the day of gas for cooking purposes, or gas for domestic heating in one part of the year only. The industrial uses are practically continuous from Monday morning until noon of Saturday, and from January through the year to December. Considering this, there appears to be good scope for (by specially interviewing and circularizing the trade generally) enlarging this branch of consumption. A trial of gas for such purposes would undoubtedly lead to permanent adoption. The advantages to the user are many and convincing. The heating of tools by gas, for example, is much more cleanly than the old-fashioned way; and there can be no two opinions as to the economy, the efficiency, and the saving of labour by having a means of heating that does not require the attention a coal or coke fire demands to keep it in the clear incandescent condition necessary for the work.

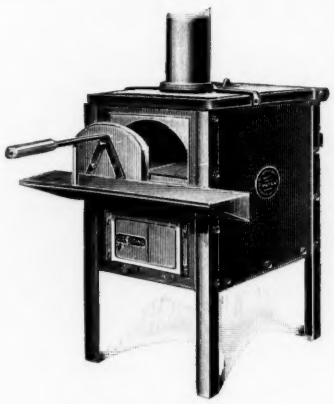
Our attention has been specially directed to this matter at the present time by learning from the Richmond Gas Stove and Meter Company, Limited, that they have been developing their productions and business in this particular line, to meet the demands for heating appliances in all kinds of industrial occupations, and that they intend to extend the range of such appliances as new and suitable designs for further uses are prepared.



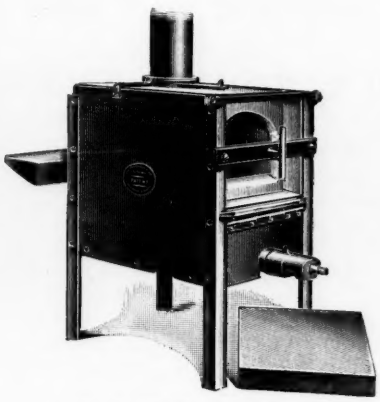
A Section of the Gas Crucible Furnace.

Patent gas muffle furnaces are a line in which the Company inform us they are doing a considerable business. These furnaces are worked by a natural instead of forced draught, and incorporate several advantages. Uses for such furnaces are found (among other purposes) in assaying, tempering, hardening, and annealing, and in such arts as enamelling and glass and china painting—in fact, for laboratory and workshop purposes generally. Before describing the construction, some general observations may be made on principles and conveniences, to which attention has been drawn. One important feature pointed to in these strongly built furnaces is that the muffle is placed in position from either the back or the front of the furnace, thus obviating the necessity of a loose top brick, and giving to the brickwork casing a long life. Owing to the secondary air being heated before mingling with the flame of the bunsen burner, and the muffle bottom not being open to the atmosphere, rushes of cold air are prevented, and high heats are obtained with a low consumption of gas. Loss of heat by radiation from the underside of the muffle bottom is thus prevented; the life of the firebrick muffle itself is considerably prolonged; and, from the personal point of view, the attendant finds the conditions of his work quite comfortable. Almost any size of this construction of muffle furnace can be supplied, burning from 30 to 500 cubic feet of gas per hour. Except in the largest sizes, only one bunsen burner is used to heat the furnace, and therefore there is only one to regulate. The temperatures are very even, and absolutely under control; and a good working heat can be obtained in half an hour from the time of lighting up.

Another special feature is the patent gas crucible furnace, which is simple in construction, strongly built, and very efficient and economical in use. The furnaces are largely employed for melting



Gas Muffle Furnace (Front).



The Gas Muffle Furnace (Back).

A Soldering Iron Heater.

metal, for enamelling, glazing, and for general purposes; and they have a melting capacity in brass of from 2 lbs. to 60 lbs. The same advantages are claimed as for the gas muffle furnaces, in respect of natural draught, single burner, low consumption, equable and easily controllable temperature, few parts, and small cost for renewal.

If we describe the construction of the crucible furnace, it will really suffice, too, as an explanation of the principles on which the muffle furnace is constructed—for in both the principles contributing to the production of high temperature efficiency are practically identical. The exterior metal casing of the crucible furnace is lined with a thick material of special preparation. If the sectional drawing is consulted, it will be seen that the crucible rests on a cylindrical stand with closed top; and this cylindrical stand plays an important part in the heating of the air supply. Through an opening in the base of the furnace air passes into this cylindrical part, in which lateral openings are provided for the air to pass to the flame. It will be seen that this simple contrivance produces two effects—the heating of the air, and the assisting with the flames in creating a rapid up-draft. But this air supply alone would not be sufficient. There is a further ring of perforations in the base of the furnace, and further lateral openings around the casing; and from all these points of admission the travel of the air is so arranged that it must get heated in its passage. For instance, the air finding entrance through the holes in the circumference of the furnace casing, has to pass through channels formed in the thick lining. These are plainly shown in the section. The crucible itself stands in a removable cylinder, which has a rim at the top turned over outwards, so as at this point to fit close to the lining of the outer casing, with the exception of four points where openings are left. The effect is that there is between this removable part down to the supporting ledge protruding from the fixed lining, an annular chamber. The object attained by this method of construction is to cause the hot currents from the gas-flames to pass upwards, then through the slots at the top of the removable inner lining, into the annular chamber before passing away to the flue. Thus it will be seen that the objects of the construction are threefold: To secure heated air for the flames, to cause a natural up-draft, and to utilize to the utmost extent the heat, so producing economy of fuel and high efficiency. We need not describe the bunsen burner; excepting to point out that the means of regulation are simple and conveniently to the hand of the operator. As has been said, too, the muffle furnaces are constructed on the same principles of heating; shape and size making no difference to their application. The commending features of the general construction have also been described.

The firm are making extra high-power drip-proof burners in several sizes, consuming from 20 to 125 cubic feet of gas per hour. Among the points considered notable are that these burners give very high efficiency, have no gauze to corrode, are easily cleaned, and condensation has practically no effect upon them. They are fitted with air-regulators adjustable *in situ* for ensuring perfect combustion. The burners are used for heating large tanks and cisterns of liquids; and if the liquid should happen to boil over, the burner can be easily cleaned, and kept in good condition.

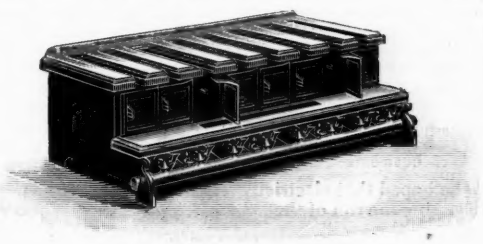
Next our notice was directed to gas-heated ovens for fancy and high-class pastry and confectionery work. These ovens can be built up to any size by units—each unit being complete in itself, and measuring (inside the oven) 24 in. wide, by 12 in. high, by 21 in. deep. The principal feature of the oven is that air is taken in centrally at the bottom, becomes heated, and has to travel up the sides between the outer casing and the lining and along the top before reaching the exits. In other words, while the oven is in use it is completely jacketted by hot-air. It has been thoroughly tested for all kinds of pastry; and the reports attest success.

Among the heaters for smaller trade purposes, an ingenious soldering-iron heater claims notice. The heater is constructed with a view to shop usage, the interior is lined with fire-brick, and the twin burner employed is a strong one. In front of the heater there are two rests for the irons. When the irons are laid on them the gas-supply is opened; when an iron is taken off, the rest being weighted at the lower end swings back and the gas supply is shut off to that particular burner. There is thus no waste of gas, and yet the heater is ever-ready for use.

A laundry iron heating stove is also constructed with a view to the conservation of heat and to economy. It is made in several sizes. Looking into one, it is seen that it is lined with fire-brick, with a central fire-brick dividing the stove into two, and all the

The Laundry Iron Heater.

space between the lining and the division "wall" is packed with ball fuel. Each side is heated independently, so that there is no waste if only a few irons are required. The casing is also so constructed that there is no waste space; the whole (tops, sides, and ends) can be used for heating the irons.



Tailor's Automatic Iron Heater.

The tailor's goose has quite a large series of heaters provided for it. They are made in sizes for taking at one time two, four, six, eight, or twelve tools.

These are only a few examples of the heaters the firm have designed for industrial use in developing this branch of their business. As was said in the opening, it represents a side of the gas business in which there are good opportunities, and the time is opportune for seeing what can be done in this direction.

Young and Glover Vertical Retorts.

The trial installation of vertical retorts which is being erected at the St. Helens Gas-Works is in a forward state. A considerable portion of the structure has been erected; and it is anticipated that during the summer the retorts will be ready to be put into operation. Auxiliary plant is also being provided, so that the trial installation can be tested as a complete unit separately from the present carbonizing plant.

INTERESTING FEATURES FOR GAS MEN AND CONSUMERS AT THE FRANCO-BRITISH EXHIBITION, SHEPHERD'S BUSH.

A TRULY great show, and for the eyes a feast of remarkable splendour, are what will, in the course of two or three weeks, be offered, at the Franco-British Exhibition at Shepherd's Bush, to the pleasure-seekers of London and the British Isles, and to our visitors from beyond the seas. The opening was last Thursday; and the ceremonial attractions of the day have had world-wide description. The buildings—numerous, large, and extensive, graceful in outline, artistic in design, and with their many domes and minarets standing out in bold relief among, and lending charm to, the surroundings—were practically finished by the day of opening. But the grounds in nearly every part were as grounds are when a building is approaching finish. The litter and the surplus material, and the deep ruts of heavy traffic abounded. Work was, however, being prosecuted with energy characteristic of a great desire, to make smooth the rough ways of the broad and sweeping paths, and to produce verdant lawns and extensive and beautiful flower beds. Inside the buildings were busy the erectors and furnishers of the handsome stands wherein will be shown examples of the industries and arts not only of France and Great Britain but of our Colonies and Dependencies. It is all work of the highest class that supplies the frame and filling of this extensive and almost bewildering show. Expense has not been spared. Wandering in the "Court of Honour," in the numerous "Palaces," in the vast grounds, and looking upon the work so far as finished, there can be forgiveness that an accurate measurement of time was not made for the completion of such a vast enterprise, with its details countable in their hundreds of thousands.

But we are not concerned here to describe the sights and the pleasures in store at Shepherd's Bush during the next six months. The pleasures are to be of a superlative order; and they will constitute the great lodestone of the exhibition, and the buildings that border on the scenes of pleasure will—very naturally—receive the greater attention from the multitude than the more distant buildings. And the extensive machinery halls are among the latter. We regret this, as also that the exhibition authorities have not seen fit to adopt gas to a larger extent in their general scheme of lighting. Half-a-million electric lights they advertise have been installed, so as to add to the charm of the night scenes. The buildings that first meet the eye are outlined with incandescent lights; the minarets, the domes, the kiosks, the lakes, the waterfall (with the handsome "Congress Hall" in the "Court of Honour" as a background), the interiors of the buildings (save the India Palace), the Stadium are all lighted by electricity. Electricity has nothing of which to complain. It has here a big advertisement, and without cost to the industry. The Hammersmith Borough Council are the contractors for electricity; and they are supplementing their service by a supply from the Kensington and Knightsbridge Electric Light Company—the estimate of the cost of the electricity that will be required during the six months being about £40,000. It is regrettable to learn that electricity maintained its reputation at the "opening" of the show by the Prince and Princess of Wales. This is how one daily paper refers to the matter:

> When everybody was anxious to witness the scintillating effects of an illuminated cascade beneath the Royal balcony, the mains refused to send forth more than a slight trickle of water, and the thousands of many-coloured lamps which were to throw their beams upon the bubbling waters refused to shine. Similarly, the scores of thousands of lamps which outline all the handsome buildings fronting on the Court of Honour did not burst into light, as the people had been led to anticipate; and while the crowd were waiting for the light to signalize the opening in a blaze of glory, the first part of the ceremony ended. There was little enthusiasm.

It is to be hoped that electricity will not play any of its notorious pranks during the run of the exhibition, with so much dependence being placed on it for illumination through the dark hours. Within the buildings, there is much of great value.

Beyond the Court of Honour and the beautiful Elite Gardens with their abutments of handsome buildings, we come into the broad "Avenue of the Colonies;" and this is being lighted, and right away down the avenue leading to the Machinery Halls, by the new high-pressure Keith lamps, each of 1500-candle power, as recently described in our pages. Truly here we shall have a magnificent and lustrous spectacle. In another, but small, part of the grounds (as will be seen later), "Thermopile" gas-lamps are being used, by Moffat's Limited. In the India Palace, there is a fine display of inverted gas lighting; and then in the Gas Section we shall have—what the gas industry is paying for—the result of the labours of the Gas Section Committee (of which Mr. H. E. Jones is Chairman, and Mr. James W. Helps is Hon. Secretary). We can promise that the result will be—we will not say worthy the strenuous efforts the Committee have put forth, but a display the excellence of which could only have been surpassed had the gas industry dipped very much deeper into its pockets, and given them the wherewithal to have completely filled the space at their disposal with popular demonstration, without having to appeal to the manufacturers for a miscellaneous collection of exhibits that will not represent to the public any more than small parts of the mechanical and fixed plant of gas manufacture. The space so occupied could, had funds permitted, have been utilized in further demonstrating the industrial uses of gas. But it is an expensive matter exhibiting at such an exhibition, where the authorities gather in revenue by every discoverable means. As a whole, however, the display that will be made in the Gas Section will reflect the highest credit on all who have been associated with its organization. The domestic uses of gas are being demonstrated to perfection; as also are the industrial uses up to—let this be emphasized, so that our electrical competitors shall not be misled—the point to which they go. About the gas lighting and the gas exhibits more presently.

It must not be imagined, however, that the Gas Section (which fills a comparatively small space in the 8 acres of the Machinery Hall), the lighting of the India Palace, the Keith high-pressure lighting, and the "Thermopile" lamps, comprise the sole representation of gas at the exhibition. Those are the uses of gas that will mainly meet the public eye; but, behind the scenes, there will be a tremendous use of gas of which the public will know little or nothing. The large meters that are being installed here and there in the buildings on the 150 acres, suggest a goodly use for motive power and in the extensive commissariat department. Perhaps, however, a better conception of the amount of gas that it is estimated will be required in the exhibition will be formed if we state that the Brentford Gas Company (who are the contractors for gas to the exhibition, which is situated in their district of supply) have a 7000-light station meter coupled up to one of their 12-inch mains, and a 10,000-light meter registering gas drawn from a 12-inch main of the Gaslight and Coke Company. In the exhibition grounds the gas supplies are connected up, and thence are distributed through 9 and 6 inch mains. From the meters, the gas supply is entirely run by the exhibition authorities. More the pity! There is here matter for complaint; and it was very properly raised at the recent conference of the Gas Section Committee with a number of representatives of gas plant and apparatus manufacturing firms. The Brentford Company's price is 2s. 9d. per 1000 cubic feet; and the exhibition authorities, following their policy of making revenue out of every convenience they afford the exhibitors, are charging the gas at 3s. 6d. per 1000 cubic feet for lighting and 3s. for power. The Gas Section Committee have been working to get the exhibition authorities to adopt a more reasonable attitude in this matter. It is to be hoped they will have success. It is a strange thing for makers of gas to be paying such a price for it. What the exhibition authorities are doing now will not be of any assistance to them in the promoting of future exhibitions on this site, for which a long lease is held, and which suggests that exhibitions at Shepherd's Bush are to be annual enterprises for many years to come.

Chemical Exhibits.

In no part of this article do we pretend that the account of the exhibits in which the representatives of the gas industry will be interested is complete. There were no catalogues to guide at the time of our visit, stands were incomplete, and the place is extensive. Therefore in its main parts and in its corners may be other exhibits that will be of interest to our readers. If there are any such, we shall be pleased to hear from the exhibitors as early as possible.

Obtaining admission at the main entrance, a walk through a corridor ¾ mile long brings one into the Palace of Various Industries. Stepping out of this, one is in the Court of Honour, on the right hand side of which stands the Palace of British Textile and Chemical Industries. Walking through this, it is seen that the chemical works of the Gaslight and Coke Company have an exhibit which, if not extensive, illustrates the vast ramifications of chemical manufacture resulting from the production of gas from coal. There are shown numerous of the more important products obtained from tar and ammoniacal liquor. Creosote, carbolic acid, naphthalene, benzol, and numerous other derivatives, explosives, and poisons, ammonia in its various forms, cyanides, prussiate of potash and soda, and aniline dyes. Some of the finest crystals of prussiate of soda that we have ever seen are in this case; and the cyanide exhibits are also specially good. It is a pity the case is lit by electricity; but it was Hobson's choice—in this building, only electricity being employed. Stands hard by are in the occupation of Messrs. Brunner, Mond, and Co., the United Alkali Company, Limited, the British Alizarine Company, Limited, the Clayton Aniline Company, and the Burmah Oil Company.

The Keith High-Pressure Gas-Lights—Sixty to Seventy Candles per Cubic Foot of Gas.

No gas man will visit the exhibition without, as early as possible after lighting-up time, going to see the magnificent effect of the lighting by the Keith and Blackman high-pressure inverted gas-lamps in the broad Avenue of the Colonies. We say magnificent, because there is certainty that it will be so (although at the time of our visit the lamps were not in use, due to the backwardness in the matter of the exhibition authorities), inasmuch as there is ample authority of the Scottish National Exhibition for

saying it. The lamp columns are spaced only 30 feet apart; and the lamps are suspended from swan-necks some 13 feet from the ground level. The lamps themselves need no description, in view of the special account that lately appeared in our columns (*ante* p. 278). But we believe there will now be some 230 of the lamps in use; and the gas will be supplied to them at a pressure of 55 inches, by compressing plant of the rotary type, driven by gas-engines, and situated in the Gas Section. The pity of it is that the public will not appreciate from the mere fact that there is a highly brilliant illumination afforded by these lamps, the smallness of the consumption of gas by them, and the comparatively low cost of obtaining the illumination. The public will not realize that the lamps are each giving a light nominally of 1500-candle power (but actually rather more), which is obtained on an hourly consumption of only 25 cubic feet of gas each, or for the whole lot—reckoning there will be, when the scheme is completed, 230 lamps—only 5700 cubic feet of gas per hour. Calculating an efficiency of only 60 candles per cubic foot, there will be an aggregate illuminating power from these lamps of 342,000 candles! Another important point is that the 1500-candle power will be obtained from a single mantle only 1½ inches in diameter by 3⅜ inches deep.

The Lucas "Thermopile" Lamp.

While speaking of the exterior lighting, it will be convenient to mention that Moffat's Limited, by arrangement with the Gas Engineering Committee, have arranged to light up a portion of the grounds adjoining Sections 13 to 19 and 20. For this purpose, Moffat's Limited intend to use Lucas "Thermopile" lamps, each giving a minimum of 1200-candle power. This particular lamp is, as our readers are aware, one of the latest tributes to the gas industry's progress. The high flame temperature and consequent great candle power is obtained by driving into the burner a large volume of air by means of a small fan, the motive power of which is electrical. The simplest, the cheapest, and the most trustworthy means are used for generating the small current of electricity that is necessary for the purpose—namely, the "thermopile." The thermopile consists of a series of electro-positive and electro-negative metal strips joined together in pairs at both ends; the inner ends resting in the warm zone (created by the waste heat of the burner), and the other ends away from the heat. The result is that a small current of electricity is generated, and transmitted to a little motor fan at the bottom of the lamp, which, by its rotary action, drives the requisite amount of air properly mixed with gas, into the burner head. One very important point is that the working parts are below the heated area, and consequently have a very long life, and require but little attention. Although only 1200-candle power is claimed per lamp, as much as 1814 candle power has been obtained under quite normal conditions. It is an interesting lamp, and will merit the attention of visitors.

The Lighting of India Palace.

Approaching at night time India Palace, which borders on the the avenue lighted by the new Keith lamps, it will be seen that the towers of the palace are illuminated by incandescent gas-lamps. In each of the four towers there are four lamps. The total number of burners in use is 64; and the total illuminating power will be about 9000 candles.

Passing inside the India Palace, it is seen that the whole of the lighting is by inverted gas-lamps of the New Inverted Company's "Nico" pattern. The brackets and pendants used in this lighting were specially designed, and were made (to the supplied design) by Messrs. William Sugg and Co., Limited. They are handsome examples of work. The main part of the building is lighted by clusters of three burners suspended from brackets; and in the colonnades are the pendants, each of which also carries three burners. Every burner has a separate bye-pass supply, and the lighting up is by cocks on each bracket.

THE GAS SECTION COMMITTEE'S EXHIBIT IN THE MACHINERY HALL.

A Picture of Refinement.

An interesting walk from the India Palace through the avenue lighted by the high-pressure gas-lamps brings one to the Machinery Halls, which are arranged in this form ⊓.

In the extensive end building connecting the right and left wing is located the heavy machinery; and in the long buildings constituting the two wings are French and British exhibits used in the industries employing mechanical power, including exhibits of coal. Several sections have here arranged a combined exhibit. Among the exhibits are found gas-engines using producer gas, and gas-engines using town gas, and there is a large assortment of machine tools which will interest gas engineers with fitting-shops for the repair of their ever-growing mechanical plant.

But it is to the Gas Section that we have to go—the section that is of primary importance to us as an industry. It is not yet completed; and we do not blame Messrs. John Barker and Co., of Kensington, who are the contractors for the buildings, and who are furnishing the suite of apartments, for refraining to put in what will be handsome examples of furniture until the flying of dust and grit produced by erectors in the buildings and the placing in position of heavy machinery, has come to an end. It would be unfair to expect them to do it; and the exhibit will in the future look all the better for the precautionary delay. Certain of the officials in the Chief Inspector's Department of the Gaslight and Coke Company have taken charge of the execution of the work of fitting up the apartments with gas-fittings of divers description. We have seen enough of the building and preparatory work, and have knowledge of the completed work, to say that these apartments will represent a picture of refinement, and demonstrate well the decorative and utilitarian places that gas has in the household, from the kitchen, laundry, and bath-room, to the delicately appointed drawing-room and best bed-room. In a fortnight what is described now from the work so far done and admission to the secrets of intention, will be seen in reality.

The suite of rooms occupies a central position in the space devoted to the Gas Section. It is separated by a public walk on one side from the range of stands demonstrating just a few of the industrial uses of gas, and also by a public walk on the other side, from the space allocated to the firms showing gas plant, models, and photographs of work. The central building, divided into the suite of apartments, occupies a ground space of 100 ft. by 35 ft., and rises to a height of 16 feet, and each room is a clear 11 ft. 6 in. from the floor to the ceiling line. The building is constructed of a strong wooden framework, filled in in the manner now common in exhibition building work. There will be no mistaking the position of the Gas Section directly the Machinery Hall is entered at night time. In central positions on the upper part of the four sides of the building, there are four large specially designed brackets, on each of which will be suspended one of the Keith new high-pressure inverted lamps of 1500-candle power. At each top corner of the building will be an urn fitted with a large globe, containing a 1000-candle power vertical incandescent burner; and the entire top will be picked out with some 400 bucket lamps. On all the principal posts of the building, there will be a specially designed bracket, bearing inverted gas-burners. The exterior of the stand will therefore be brilliantly and picturesquely illuminated. The high-pressure gas-lamps will be in juxtaposition with the electric arc lamps used in the general illumination of the building, so that there will be an opportunity for the public to make a close comparison.

So much for the exterior of the building and its illumination; and now attention may be directed to the apartments. The whole of the apartments will be open on the outer side; but between them and the public will be a protecting rope. Lengthwise of, and central in, the building, however, runs a corridor between the two ranges of apartments; and from it each room can be entered. We go to the end of the building nearest to the Electric Lighting Companies' stand to find the entrance hall.

Entrance Hall and Corridor.—The decoration of the hall and corridor is in the Georgian style. It is to be heated by a gas-stove of cathedral design, and illuminated by ceiling and wall-lights, both inverted and upright. The brackets are of a nice decorative type.

We will take the rooms in the order in which they are arranged from the entrance hall. First at the corner, there is the

Billiard Room.—This is fitted by Messrs. Stevens and Sons, of Villiers Street, W.C. The table has been designed specially for the apartment, and is, therefore, only 8 ft. by 4 ft. It is being made in the massive style of a full-sized table. The walls are being finished with 8 feet of oak panelling. The gas-fittings are to be of oxidized silver, carrying inverted burners, and operated by the Norwich switch. A suitable gas-fire will be fitted for the heating. The next apartment is the

Boudoir.—The gas-fittings for this will be of French style, with pneumatic lighting and extinguishing arrangement. There will be a gas "burner" fitted in a plain interior grate. Following, is the

Dining Room.—The appointments of this are in the Georgian style. For lighting, it is fitted with inverted burners; and for heating, with an ordinary gas-fire.

The Kitchen.—Somewhat of an irregularity has been perpetrated here, for convenience. The kitchen is directly open to the dining-room—the idea being to give space for demonstrations in the kitchen, and to allow small audiences at a time to use the dining-room. This is the proposal; its fulfilment will depend on the one question as to whether the noise of the machinery in the hall will permit. This remains for the test of time. The fittings of the kitchen and the emdeca covering of the walls will preserve a complete distinction. Three systems of water heating are fitted up in the kitchen, to show how houses can be supplied with hot water without an ordinary kitchen range. A double-oven cooker, grill, gas-irons, &c., will also be seen in use. The kitchen is lighted by upright incandescent burners.

Scullery.—This is fitted with an automatic hot-water circulator, and is lighted by upright incandescent burners. The front range of apartments is completed by the

Laundry.—This will be a popular apartment, for actual work will proceed here. It will have its own gas-engine and compressor for an independent supply of high-pressure gas; and all the operations (together with the lighting) will proceed by its use. It will be a complete working laundry. Washers, wringers, drying-machines, and irons will derive their motive power or heat as the case may be from gas.

We have now to take the range of apartments on the other side. First, there is the

Nursery and Play-Room.—Toys scattered about in the style approved by the infantile occupants of such apartments will give an air of reality to the room. The walls, too, are to have a nursery picture dado. The lighting will be by upright burners, fitted with the pneumatic switch. There will be a nursery gas

fire with boiling burner; and a hot and cold water supply. Next to this apartment is an

Ordinary Bedroom (Adam Design).—This is to be fitted mostly with inverted burners and pneumatic switches, and heated by a Sheraton fire. Pneumatic switches are fitted on both sides of the door, so that the lights can be switched on and off at will. Between this room and the best bedroom is the

Bath-Room.—This is being fitted with a bath and wash-hand basin, and an instantaneous water-heater. The heating will be by a condensing-stove, as well as by an ordinary gas-fire.

Best Bed-Room.—In this room the lighting will be by inverted burners with a "Surprise" pendant over the centre of the dressing-table. The whole of the lighting will be controlled by the pneumatic switch. The room contains two fire-places—one fitted with a gas-fire in a grate of Louis design; the other with a fire of Adam design.

Library.—Upright and inverted burners are used for the lighting of this apartment. A fret-fire is fitted in the grate.

Drawing-Room.—This is a very pretty room, in Adam style even to the mouldings, wood-work, and gas-fittings. Here for lighting will be found table and floor gas-lamps, fitted with upright burners, as well as gas "candle" burners on the walls. The heating is by a log fire; and there is also to be a four o'clock gas kettle-stand.

The Decoration and Furnishing of the Rooms.

In the foregoing, we have shown how demonstration is to be made of a variety of ways in which a house or flat can be correctly illuminated and heated, and various other conveniences of gas be obtained. But nothing particular has been said as to the decoration and furnishing of the apartments, which will give to the exhibit an air of refinement in the principal rooms and in the domestic offices an air of completeness in serviceability. Let us go through the scheme of decorating and furnishing the rooms that has been adopted, and has been entrusted (with in the result great credit to themselves) to Messrs. John Barker and Co., Limited, and has received, and is receiving, the personal attention and supervision of Mr. John Dunkin of that firm. The work they have in hand is all part and parcel of the attractions for gas in the section.

The entrance hall (as has been said) is designed in the Georgian style, with panelled walls; and with a splendid chimney-piece in carved wood. The fireplace has a tiled recess, prepared for a grate, which will be an exact reproduction of the period. The furniture, in Spanish mahogany of massive design, comprises fine old grandfather chairs, settee, and specially designed tables. A spacious corridor (as already mentioned) leads the visitor from the hall to the various rooms. The first room on the right is the billiard room, which, fitted up in solid oak, represents the period of the English renaissance, and will be unique in its completeness—everything having been specially designed. The easy chairs are covered in tapestry copied from examples at Knowle Park. The ceiling of this room has a cornice modelled from one in the South Kensington Museum; and the utmost care has been exercised in keeping everything in this room in perfect harmony with the style. The billiard table, as previously stated, is by Messrs. Stevens and Sons, of Villiers Street. The next room—the boudoir—in the Adam style, is a perfect example of this charming period, and is sure to be much admired for its beautiful decoration. The walls are panelled, with artistic mouldings, divided with pilasters. The cornice and frieze in modelled plaster, also the overdoor, are all pure Adam decoration. Eighteenth Century satinwood furniture of the Sheraton style, inlaid with tulip wood, has been made, and will be very dainty; while the carpet of pastel green is bound to be much admired by the ladies.

The dining-room, of spacious dimensions, is in the Georgian style of the best period, with a fine modillion cornice, adapted from Hampton Court. The chimney piece is also a reproduction; and, with the panelling and overdoor, completes what may be considered the best room in the exhibit. The kitchen next in order has the walls lined with emdeca, and is, like everything else, finished as if ready for the cook to appear. No expense has been spared even in this part of the work. Tiled interiors to the fireplace, sinks by Doulton, and furniture which will be a lesson in equipment, will cause much comment as to the care with which the whole thing has been considered. The scullery, lined with emdeca, is also well in evidence; and it leads to the laundry, in which everything of the latest design in equipment will be seen. emdeca is here again being used for the walls.

On the other side of the corridor, the first room next to the entrance hall is the drawing-room adapted from the Adam period, and will be very rich in effect, owing to the charming manner in which the decoration has been designed. Of spacious dimensions, it will be filled with furniture representative of the finest English workmanship, decorated in colour on satinwood, a Steinway grand piano, inlaid with rare woods, and specially made for the room. Carpets perfect in colour will lend a charm to this room that one must see to appreciate. In contrast to this, the next room, of the Queen Anne period, is the library, and will be a scheme of colour; being in green, exactly as in the olden time, and furnished with waxed walnut furniture.

No house is complete without that very useful room—the bedroom; and the two apartments arranged for the purpose are likely to be as attractive as any other in the show. A charmingly decorated ceiling and cornice with a frieze, combined with rose-coloured wall papers, and carved chimneypieces, complete a scheme unique of its kind. Fine mahogany inlaid bedroom furniture, of the Sheraton period, representative of real English comfort, will form an attractive exposition of how such rooms can be treated.

For ideas of what to do with a spare room, if one has children, visitors to the exhibition should see the nursery, which has been installed to make complete the English home. This room is a good illustration of what one should do for the children, and is full of ideas, both for the comfort and pleasure of the little ones. Cupboards, bookcases, toy cabinets and chairs in oak, tables and chairs all *en suite*, are there; while useful toys are about, as if the little ones were actually in residence. The frieze is papered with the latest in illustration of nursery rhymes.

The bathroom has been taken in hand by Messrs. Doulton; and it will be unnecessary to say that this means the best of everything. Hot water will be as easy to obtain as cold; while emdeca is used for the walls. The finest of majolica chimney-pieces is fitted in place of the usual wood ones. Lavatory fitments and metal work of the latest pattern have been selected with equal care, and complete a scheme in harmony with the fine work of the entire suite.

Taking the scheme as a whole, nothing of its kind—either in quality of work, size, or completeness of detail—has ever been attempted; and it is safe to say it is as good as anything in the exhibition of what an English home is, and can be, in comfort and luxuriousness.

Industrial Section.

Opposite this last range of apartments is the gas industrial section. It occupies a space 100 feet by 15 feet deep, and is divided into five apartments.

Gas-Compressing Plant and Electricity Generation.—In the first space is staged the Keith and Blackman high-pressure plant from which the gas is supplied for the 230 1500-candle power lamps in the grounds. The compressors are of the rotary type, driven by two 4-horse power Gardner gas-engines. A 6-inch main conducts the gas all round the western end of the grounds. The high-pressure gas will also be available for use by other exhibitors—notably for mantle making. There is also here an 11-horse power gas-engine, coupled up to a dynamo, for generating current for driving electric fans or for motive power, as required.

Mantle Making.—The next division of the industrial section will be furnished with all the necessaries for mantle making; and the work of making mantles from stocking form to the non-collodionized mantle (as used by the Gaslight and Coke Company) will proceed continuously during the run of the exhibition. A small gas-engine will be in use here.

Tinman's Shop.—Another interesting display will be the working tinman's shop, occupying the third division. Here two men will be engaged in meter making; and a small gas-engine will be used for motive power.

Artistic Enamelling.—If this part of the scheme is carried out, there will be fascination for many in watching the artistic enamelling work, which, it is hoped, will be carried on in the succeeding division under the supervision of Mr. Alexander Fisher, who is celebrated in this fine art. His work includes champleve, cloisonne, bassetaille, plique a jour, and limoges; and it is carried on by the aid of Messrs. Fletcher, Russell, and Co.'s gas-heated muffle furnaces. These enamelling furnaces are well-known by reputation, if not by actual use, to most of our readers; and in his work Mr. Fisher has long employed them.

Glass Making.—A definite determination has not at the moment been arrived at as to the purpose to which the final division of the industrial section shall be devoted. But, if present plans can be completed, there will be demonstrated here glass making with furnaces heated by high-pressure gas, supplied under the Onslow system. The furnace would be situated outside the building, with a covering having a glass front, so that visitors can inspect the complete operations. The glass would be run into the apartment through a specially constructed conduit carried through the wall of the building; and there it would be usefully dealt with. The gas-heated glass furnace can accomplish as much as a coke-heated furnace in one-fourth of the time. The process may prove somewhat more expensive for fuel, but the saving in time is remarkable. If this proposition can be consummated, it will form an attractive feature of the display.

Other Gas Exhibitors.

In response to the invitation of the Gas Section Committee, the following firms have already taken space on the opposite site of the suite of apartments:

Clayton, Son, and Co.	Laddite Incandescent Mantle
Samuel Cutler and Sons.	Company, Limited.
Gibbons Bros	Mobberley and Perry.
W. J Jenkins and Co.	Joseph Taylor and Co.

Scott-Snell Vacuum Gas Compressor Company, Limited.

[Other firms are also in negotiation for space.*]

Messrs. Clayton, Son, and Co., Limited.

At Stand No. 581, this firm will be showing photographs of gasholders and structural work erected by them in different parts of the world; also a section of Clayton and Pickering's patent spiral guide for gasholders. They are also exhibiting a welded steel water-main 18 ft. in length by 33 in. diameter—part of a

* We shall be pleased to receive from all whose exhibits are not noticed here, an account of what they intend showing.

Contract for 20 miles of main for the Leeds Corporation. Also a corrugated flue for marine boilers, Deighton's section, Gourlay type; while from their waggon works they are showing a steam tipping waggon of a type eminently suited for gas-works, for conveying coke, &c. Complete arrangements have not yet been made regarding the character of the firm's exhibit on the space in the Gas Engineering Section.

MESSRS. W. J. JENKINS AND CO., LIMITED.

This firm have taken a space 30 ft. by 19 ft.; and they will be showing a "D.B." projector, fitted in travelling frame, with measuring-chamber, and power travelling and hoisting gear in operation on full size (22 in. by 16 in. ▭ 10 ft. long) retorts. There will also be a "D.B." projector (suspended type), arranged with travelling carriage running on overhead rails. Among other exhibits will be a large coal-breaker, capacity 20 tons per hour; a high-pressure blast fan; and a gas cleaning fan, suitable for cleaning producer gas for use in gas-engines, furnaces, &c. Gender's patent slideless railway point switch will also be on view. This switch does away with oiling of switches, and prevents splitting of trains due to improper closing of points. Drawings and photos of gas-works plant, gas cleaning and other centrifugal fans, with models of the "D.B." coke-conveyor and the "D.B." projector will complete an interesting display.

LADDITE INCANDESCENT MANTLE CO., LIMITED.

This Company's exhibit will consist of a display of high and low pressure mantles of the make which testimonials show are growing very largely in favour. The Company will also demonstrate the work of mantle making. This is bound to be of great interest to those visiting the section.

MESSRS. MOBBERLEY AND PERRY.

This firm will be exhibiting examples of their well-known fire-clay goods—including fire-clay, generator and regenerator bricks, tubes, air-port blocks, stays and saddles for horizontal retort-settings, tiles, arch-bricks, scurfing and sealing blocks, lining bricks, retort-shields, model retorts, boiler-flue covers, &c. It will be a very interesting display for the gas engineer.

MESSRS. JOSEPH TAYLOR AND CO.

This firm are doing their utmost to make a display which will appeal to the gas engineering visitors to the exhibition; and their intentions comprise everything of possible interest relating to the chemical and bye-products side of a modern gas-works. They will be staging models of every form of saturator, framed photos showing various builds of saturators, acid tanks, sulphate drainers, ammonia and acid catch boxes, plate lead acid eggs, lead seal pots, lead syphons, acid washers, steam sulphate dischargers, &c. There will also be samples of lead burning, of solid drawn lead pipes, as employed in their makes of saturators, acid cocks, acid elevators, copper scoops, lead-burning machines, &c. The firm believe that they are not exaggerating in saying that the photos displayed represent the largest collection of leadwork ever seen under one roof.

SCOTT-SNELL VACUUM GAS COMPRESSOR, LIMITED.

There will be seen at this stand—we believe for the first time at a public exhibition—the latest of the ingenious products of the brain of Mr. Scott-Snell. It is a vacuum gas compressor, the driving power for which is obtained by the expansion up to atmospheric pressure and subsequent contraction of hot air in a cylinder, which is heated at one end by a ring-burner and cooled by radiation at the other end—thus producing an intermittent vacuum, which in turn actuates a pump. This pump sucks in the gas on the up-stroke. and expels it on the down-stroke, compressed to 10 inches water-gauge (or other pre-arranged pressure) into the high pressure service to the burners. The action of the machine is as follows: On igniting the ring burner, a cylinder is heated at the upper end, the bottom remaining cool. In a few minutes, upon reciprocation being communicated to a displacer within the cylinder, the air is alternately expanded and rarefied. When the latter occurs, a vacuum is formed within the cylinder, and a diaphragm (closing the bottom of the cylinder) is forced upwards, lifting the pump by intermediate links, and causing the gas to be pumped into the high-pressure service in conjunction with which is an anti-pulsator to prevent any fluctuation. Once started, the machine maintains motion by a chain and gear, which, by suitable connecting rods, communicate motion to the displacer. The motion of the machine is continuous; and the pressure is said to be unvarying whatever the number of lights in use. The principal advantages of the compressor are stated as follows: Low initial cost; requires no driving power, such as water under pressure, electric or other motor; needs no attendance; it is entirely self-contained; it is automatic in action; the increased pressure remains constant, notwithstanding any variations in the demand on the service; occupies small floor space (a plant of 10,000-candle power requiring only 18 inches square); and economy in running expenses (limited to the gas consumed in the ring burner, from which the motive power is derived).

COMBINED ELECTRICAL DISPLAY.

Next to the Gas Section stand, the Electricity Companies of London have (as announced last week) secured space, on which they are, in the main particulars, following the lead of the Committee of the Gas Section. They only summoned up sufficient enterprise to come in just before the twelfth hour. They, too, are going to have a suite of apartments, to demonstrate private lighting and the domestic uses of electricity. They, too, are going to show small electrical plant used for industrial and other purposes. They, too, will have their reception and information bureau; and, as a set-off against mantle making, they will show the making of incandescent electric lamps. Imitation is the sincerest form of flattery. However, as neighbours they are heartily to be welcomed, because, as many electricians, judging from their disparaging talk of gas lighting, go about with their eyes shut to its advances, the proximity of stands will afford them an opportunity of sparing a few minutes at the Gas Section rooms for a little enlightenment.

As has been remarked, there are in the Machinery Halls several exhibits which will arrest the attention of gas men. Among them will be noticed that of the

WIGAN COAL AND IRON COMPANY, LIMITED.

It would be a great omission if, in such a multitudinous collection of exhibits appertaining to engineering and industry generally, the fundamental raw materials were not included. There are representative displays of coal and iron; and, for us, notably is that of the Wigan Coal and Iron Company, Limited. The eye is first arrested by some unusually large blocks of coal from different seams that the Company are working. A better idea of the immense size of these blocks will be obtained when we say that some of them weigh above 6 tons! Then there are cases in which are displayed some of the different gradings of coal, nuts, &c., suitable for house fires, gas making, steam, and other purposes. Also coke from the Company's Siemens-Solvay plant, with some of the bye-products. There are also on view examples of flags made from blast-furnace slag. And further, numerous samples of pig iron and of steel, the latter being shown in bars, rods, &c., as well as in various forms in a finished state. Further interest is found in a number of photographs, specially taken for the exhibition, illustrating some of the Company's different collieries, screening arrangements, &c., together with views of the blast-furnaces, iron works, steel works, rolling mills, &c. The stand is No. 559.

MESSRS. CROSSLEY BROS., LIMITED.

The firm have a representative exhibit of gas and oil engines, part of which form a working exhibit in connection with a suction-gas plant. Gas-engine working with town gas is also demonstrated. The suction-gas plant is a standard No. 8 size operating with anthracite fuel, supplying gas to a Crossley four-cylinder vertical engine, shown as a working exhibit. The engine shaft is extended, and is direct-coupled to a continuous current dynamo built by the General Electric Company. The capacity of this machine is 140 kilowatts, and the voltage 220, when running at 250 revolutions per minute. The whole forms a very compact plant. The starting of the vertical gas-engine is effected by means of compressed air, contained in three steel receivers. These receivers are charged with compressed air obtained from a Crossley "L" type engine and compressor—an operation only necessary occasionally, as the loss of compressed air is not more than from 5 to 10 lbs. each occasion of starting up. This vertical engine is fitted with forced lubrication supplied from two valveless oil-pumps within the engine base-plate; the oil being filtered before passing to the various bearings.

In addition to working the engine upon suction gas, an arrangement is also made for working from town gas; and the operation of changing over from one kind of gas to the other may be performed while the engine is running. This important feature is made possible by means of the Crossley patent governing valve with which the engine is supplied.

Another gas-engine on view is of the vertical high-speed class. This engine, type "CV1" develops 5½ B.H.P. with town gas when running at 700 revolutions per minute. The engine is coupled direct to a dynamo; and the combination is mounted on a substantial cast-iron bed-plate. The weight of the complete set is 12½ cwt. This engine is provided with loose renewable cylinder liners and adjustable bearings. This class of engine is supplied with either one, two, three, or four cylinders to work on either town gas, producer gas, petrol, petroleum, benzol, or alcohol, and may be used either for stationary, marine, portable, or electric lighting purposes. It is intended especially for use when either a limited space is available, or where a high speed or a light weight only is required. A two-cylinder marine petrol engine of this class is also shown (type "CV2"), coupled to a reversible propeller, and intended for use in a launch or some similar type of vessel.

Two of the firm's horizontal oil-engines are also exhibited (type "HH" giving 1 B.H.P. at 400 revolutions, and type "NNN," giving 6½ B.H.P. at 280 revolutions. The last-mentioned engine represents a class which is rapidly gaining in favour, owing to its ability to work without alteration with either the ordinary petroleum lamp oils or with crude oils. No lamp is used, except for starting purposes.

POWER GAS CORPORATION, LIMITED.

A 2000-horse power Mond gas plant has been installed by this Corporation, and will supply power for machinery in the Machinery Hall. The plant consists of two of the well-known Mond producers, of 7 feet internal diameter, a patent mechanical washer, a gas-cooling tower, two centrifugal cleaners, two scrubbers, and a governor. The fuel to be gasified is delivered by means of an

elevator into the bunker above each producer, which, in turn, delivers the fuel into a cast-iron charging-hopper fixed at the top of the producer. The fuel on entering the producer from the charging-hopper goes into a cylindrical bell, which has for its chief object the maintaining of a constant level of fuel. The gas-producer consists of two cylindrical steel shells one within the other; the inner shell being lined with firebrick—the annular space between them forming an air jacket, in which the air and steam blast is superheated on its way to the space beneath the grate, which consists of specially designed fire-bars, set radially in the form of an inverted cone. The producer is of the water-luted type, with lutes all round, and is so constructed that ashes may be removed at all times without interrupting the operation of the producer. In other words, the producer is absolutely continuous in operation. The air-blast is supplied by a Roots blower.

The gas leaving the producer passes into a rectangular steel washer in which it is brought into intimate contact with water sprayed up into the form of rain by quickly revolving dashers or paddles. By this means, the gas is freed from dust and partially from tar, and is at the same time considerably cooled down. On leaving the washer the gas enters at the bottom of a gas-cooling tower, packed with short earthenware tubes, which effectually distributes over the whole area of the tower the water which is supplied at the top. The gas passes upwards, and on its way comes into intimate contact with the water trickling down. In this tower, the gas is much cooled, and a large amount of tar is removed. The gas then passes into a pair of specially designed centrifugal cleaners, into which a small amount of water is introduced. Herein the gas is still further cooled down, and freed from tar; and when it leaves this apparatus only contains a small trace of tarry matter, which is removed as the gas travels through the scrubbers—rectangular steel boxes, fitted with a number of trays, on which are placed simple wood planings or shavings and sawdust. The gas then passes, in a thoroughly clean state, to the gas-engine, which is of the vertical Westinghouse type, and is described below.

We are informed that the stand-by losses of this plant are extremely small, and after remaining idle for a fortnight or more, the producer may be brought into proper working condition in about twenty minutes; while, after ordinary night stoppages, it is only necessary to turn in the blast for about five minutes previous to the gas being actually required at the gas-engines.

Westinghouse Gas-Engines.

In the main Machinery Hall, will be found a 750 B.H.P. three-crank six-cylinder gas-engine of the Westinghouse new vertical tandem type, operating on producer gas generated in the above described Mond gas-producer. This engine will be direct connected to a 500 kilowatt direct-current generator, running in parallel with a Parsons steam turbo-generator also in the main Machinery Hall, for lighting the buildings and for operating the machinery. The cooling tower used in connection with this gas-engine is supplied by Messrs. Jarvis Bros., of Middlesbrough.

It will be convenient to mention here that in the Australian Section, there will also be seen a single-crank two-cylinder Westinghouse gas-engine of the new vertical tandem type. This is to run on town's gas, and will be direct connected to a 100 kilowatt direct-current generator, and one three-crank six-cylinder engine direct-connected to a 130 kilowatt direct-current generator for lighting the Australian Pavilion and for driving machinery.

In the Canadian Section, there are also two three-crank six-cylinder gas-engines, operating on town's gas and direct-connected to two 130 kilowatt direct-current generators for lighting the Canadian Pavilion, and for driving machinery.

Miscellaneous Uses of Town Gas.

Standing in front of the India Palace, almost opposite will be seen Webb's glass manufactory, the furnaces of which are heated by gas coke. Mention is made of this point, because it is (as will be seen from our description of the Gas Section), according to present plans, proposed to show, on the industrial side, glass making with furnaces heated by gas supplied on the Onslow high-pressure system.

We have mentioned elsewhere that a large quantity of gas will be used in the exhibition, apart from the special displays of lighting and industrial uses to which reference has been made. It is really remarkable the variety of purposes to which gas is put by the exhibitors, from choice based on experience. We have, for example, Messrs. Lyons and Co., the caterers at the exhibition, using about fifteen large gas-cookers; and they have had fixed six 100-light gas-meters, six 50-light, eleven 30-light, and two 20-light. They are therefore anticipating a large consumption, and are putting gas to uses other than for cooking for the multitudes who will be visiting Shepherd's Bush. We learn, too, from Mr. Alex. Johnstone, the Engineer and Manager of the Brentford Gas Company (who has kindly supplied us with some of the following details), that the two large tea houses of Liptons Limited will be lighted exclusively by gas. In them there will also be three large gas-cookers in use, and 30 and 50 light meters have been fixed for measuring the consumption. For a supply for cooking purposes, Messrs. Paillard's French Restaurant has been fitted with a 100-light meter. The Palace of Australia contains a 1000-light meter for measuring the gas consumption of the gas-engines to be employed there for generating electricity for lighting and power. The Canadian Section is being dealt with in similar manner, as mentioned in the Westinghouse gas-engine paragraph. The Scenic Railway have a 250-light meter, supplying a gas-engine for generating the whole of the power required for the railway. Messrs. Crossley Bros. have a 400-light meter for their stand in the Machinery Hall. In the same section, gas will be used by Messrs. J. Cameron, Limited, who have a 200-light meter fixed; and the Lamp Pump Syndicate, Limited, have a 20-light one. The Laddite Incandescent Mantle Company are taking a high-pressure supply through a rotary meter for (as stated above) the purpose of mantle making. The Irish Village will be supplied with gas exclusively for heating, lighting, and cooking. The Associated Newspapers, Limited ("Daily Mail"), have a 200-light meter for lighting and power. The Tunisien buildings have a 100-light and a 50-light meter for the exclusive use of gas for lighting purposes. The corridors will be lighted by Messrs. Pond and Co.'s inverted "Pilot" lamp. The whole of the lavatories in the grounds and buildings will be supplied with gas for lighting purposes and water heating with Ewart's geysers. The spiral railway, toboggan, and the spider's web, have each a 100-light meter fixed for measuring the gas for power and lighting. In Messrs. Latter's field adjoining the Exhibition grounds, a balloon was filled last Thursday (32,000 cubic feet capacity) for advertisement purposes. This is to be permanent and stationary.

All this indicates the variety of purposes for which gas is to be used in the exhibition. For the distribution of the gas, there have been laid inside the grounds 3026 yards of 12-inch pipe, and 3600 yards of 6-inch and 4-inch; while outside the grounds 824 yards of 16-inch and 12-inch have been laid—a total of 7450 yards, or equal to 4·23 miles.

GAS IN THE SCOTTISH NATIONAL EXHIBITION.

In the Scottish National Exhibition, now open in Edinburgh, gas, as our readers are aware, is very largely employed as an illuminant of the grounds and buildings, and in this capacity the arrangements which have been made cannot fail to bring home to the minds of those who are interested—and, it may be in a lesser degree, to the minds of many who have not much interest in the matter—the advantages and economies to be derived from the use of coal gas as a lighting agent. But apart from public lighting there are few exhibits relating to the gas industry.

In the matter of lighting by coal gas, the only exhibit installed is that of Messrs. William Anderson and Co., gas fitters and lighting engineers, of Scotsman Arcade, Edinburgh. This exhibit is devoted almost exclusively to the demonstration of what can be accomplished by the use of coal gas at the ordinary pressure at which it is delivered. Inverted mantles are used upon "Pharos" burners, which the firm had tested, in September last, by Mr. Henry O'Connor, F.R.S.E.

The Elwell-Smith Petrol Safety Gas Company, Limited, of Edinburgh, make a very brilliant display of petrol safety gas, generated in an apparatus occupying only a few square feet, and capable of supplying 70 lights. The generators require power, which can be derived from water or weights. The light is certified to be non-explosive and non-poisonous. It is chiefly used in the lighting of mansion houses; but larger installations for public and private lighting may be furnished, up to 1500 lights.

Of appliances for cooking and heating, the Carron Company, of Carron, Stirlingshire, show upon a large stand a gas boiling-table, with twelve burners, capable of being extended to any size; combination gas and coal ranges; the "Esto" cooker, with extended hot-plate, which is chiefly supplied to the Colonies; a gas carving-table with overhead gear; "Forth" gas-boilers, fixed and portable; a coke-grill, with overhead heater for plates; a combined gas grill and toaster on a large scale; gas-heated steam-radiators; gas-fires, in majolica enamel; condensing stoves, &c. These are substantially constructed, with high-class finish.

In the Domestic Economy Section, where cookery demonstrations are given, the Edinburgh and Leith Gas Commissioners exhibit a Richmond cooking-stove, with double burners; and a Wright automatic high-pressure boiler, of 30 gallons capacity.

The Glenboig Union Fire-Clay Company, Limited, of Glasgow, in an exhibit containing specimens of their fire-clay products, show the vertical retorts for use in the Young and Glover patented system, the agents for which are West's Gas Improvement Company, Limited. The retorts are built in sections, each having a broad flange around it. There are also two specimens of inclined retorts. Messrs. Peter and Mark Hurll, of the Garliston and Garnqueen Works, Glenboig, have also a stand of fire-clay goods, including gas retorts and fittings.

The National Gas-Engine Company, Limited, of Ashton-under-Lyne, exhibit a "National" 95-H.P. engine, worked with town gas, and an 85-H.P. engine, using suction gas, served by a "National" suction-gas plant.

In the grounds there are small pavilions, in one of which there is shown by Messrs. Miller and Stuart, of Edinburgh, the manufacture and use of "Aërogen" petrol gas; and in the other the Paterson acetylene gas plant is seen at work.

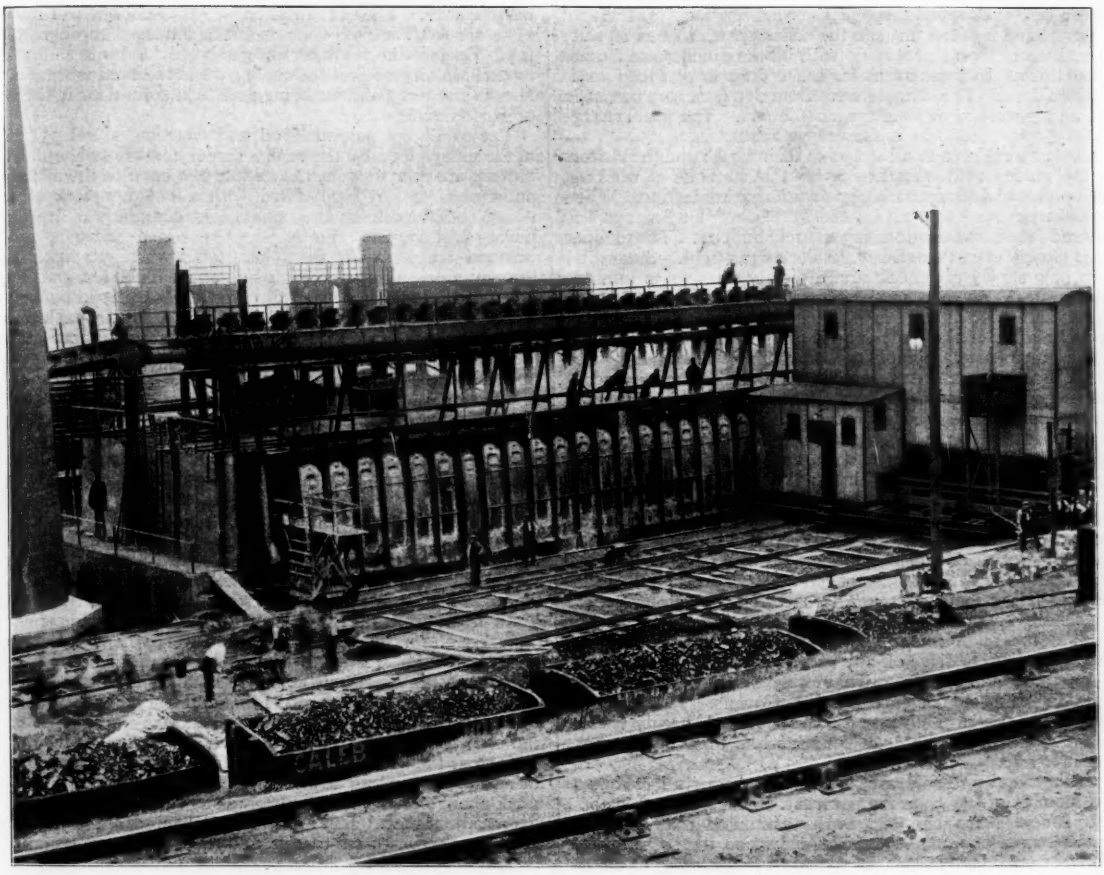
There is another exhibit which is not yet of interest, but will be worth notice at a later period of the season. It is that of the Sulphate of Ammonia Committee, who have laid down experimental plots to illustrate the advantages of sulphate of ammonia as a fertilizer. Most of the crops have been sown, but are not yet appearing above ground.

COKING AND BYE-PRODUCT RECOVERY PLANT AT THORNHILL COLLIERIES, DEWSBURY.

Joint Visit of the Yorkshire and the Manchester and District Junior Gas Associations last Saturday.

It fell to the turn of the Yorkshire Junior Gas Association to arrange for the fourth annual joint visit with their Lancashire *confrères*; and, in view of recent discussions on rival methods of carbonization, and of the growing interest in gas making in coke-ovens, it was thought that no more interesting and opportune visit could be selected than to an up-to-date coking installation with products recovery plant. The Directors of the Ingham's Thornhill Collieries, Limited, kindly acquiesced in the request to throw their plant open to inspection for the occasion. All expectations were more than realized; and the very large numbers who assembled were deeply interested in this modern Simon-Carvès arrangements in recovery coke-ovens side by side with two large batteries of the older type of beehive ovens and a singularly interesting coal-washing plant. The two batteries of the Simon-Carvès ovens were first set into working operation in February and December last; and the later one especially embodied all the most recent improvements.

On assembling at the offices, the visitors were introduced by Mr. William Cranfield, of the Yorkshire Junior Association, to Mr. J. W. Peel, the General Manager, Mr. J. Aynsley, the Coke Manager, Mr. J. Preston, the Chemical Manager, and Messrs. Lloyd and Shelley, representatives of Simon-Carvès, Limited, who had come down specially for the occasion. Mr. Peel welcomed the visitors on behalf of the Directors, and handed out printed copies of a letter from Mr. J. Lister Ingham, the Managing-Director, who was unable to be present owing to his duties as an officer in the Territorial Yeomanry, but who had made all possible arrangements for the visitors' enjoyment and instruction. The five gentlemen just mentioned then acted as guides; each party taking the plant in a different and pre-arranged order, and being successful in avoiding getting mixed up with the other groups. The full set of notes prepared on behalf of the Yorkshire Junior Association, and distributed among the visitors, added materially to their intelligent grasp of the works inspected, gave them the chief numerical details and dimensions, and helped to secure them against overlooking any important features. Among the



Simon-Carves Coke-Ovens at Ingham's Thornhill Collieries, Dewsbury.

visitors from Lancashire was Mr. Edward Allen, the Chief Engineer of the Liverpool United Gaslight Company.

The colliery is on the low hills which form the southern bank of the Calder Valley, and is about a mile-and-a-half south of Dewsbury. Three seams of coal are worked, each 2 ft. 4 in. thick, and the pit has a depth of 280 yards. About 900 hands are employed in all, and 1000 tons of coal are raised each day. Some distance away, and belonging to the same firm, is the Coomb Pit, where a memorable and terribly fatal explosion occurred in July, 1893. This pit has been but little worked since, until latterly the shaft has been deepened, and lower seams opened out. A drift about 1050 yards in length is being driven through the hillside, and is now all but completed. This will bring Coomb's Pit into connection with the present surface works, coke-ovens, sidings, &c.

As the time at the visitors' disposal was none too much for inspecting the surface plant, no descent of the pit was arranged, especially as it would have involved a walk of about a mile to the working face. Though the coal has no exceptional chlorine contents, it is noteworthy that the water in the pit-sump is distinctly salt to the taste. Starting with where the coal reaches the surface, the conveying and screening plant was thoroughly examined. As the corves leave the cage in which they have been raised, they travel by gravitation to a revolving tippler, in which they are locked, and then emptied out down the shoot leading to the screens. As the wheel regains its original position, a full corve pushes out the empty one which is carried away up a slope by an endless chain, a catch on which engages with the axle. After having been screened into various sizes, the coal falls on to picking-tables (plate-belt conveyors), where any lumps of pyrites, shale, &c., are picked out by hand, and the coal is finally dropped into railway waggons. What is able to pass through holes of 1 inch diameter is used for coke making.

To enable the Thornhill coke to meet the competition of that made from better coal—*i.e.*, with less ash and sulphur—the small coal and dust are first crushed and then washed, so as to remove much of the pyrites, &c. In addition, the presence of the moisture in the charge (10 per cent. here, on an average) is advantageous from the coke maker's standpoint, as, in spite of the absorption of heat necessary to drive it off, it moderates the temperature at which the early stages of carbonization takes place, and enables the gases to pass away more evenly, with a consequent improvement in the quality of the coke. The washing plant was in full operation, and was watched with great interest; the opinion being freely expressed that the visit was worth while arranging, even if nothing else had been on view. The coal dust is raised from the screens by a kind of inclined push-plate conveyor and carried to the washing tables. These are six in number, each capable of dealing with 45 tons per day of ten hours. Over each of these the coal is carried by a stream of water, while the table is "jigging" backwards and forwards with a stroke of about 6 inches. The

comparatively heavy rubbish falls, and is gradually jerked backwards along the floor of the table and drops out at shoots on the upper part; while the lighter coal is carried forward by the water to huge hoppers, where it drains for 12 to 18 hours. On examining the removed solids, the visitors were struck with the visibly high proportion of iron pyrites. The water is pumped back and used again for washing. The whole process is analogous to that used for dressing metalliferous ores—in fact, this special form of plant (Craig's patent coal-washer) was originally designed for treating the crushed rock of the South African gold mines. The installation at Thornhill was the first in which it was adapted for coal washing.

Formerly all the coke made here was produced in "beehive" ovens (none of which have been discarded since the recovery plant was erected); and these were next examined. They are 64 in number, set in two double rows, back to back, with the main flues along the tops. In case of emergency (and not usually employed), in addition to the main chimney at one end of the bench there is a smaller one at the other end; while in extreme cases the "loading eye" at the top of each oven can be utilized as its chimney. They are of the usual dimensions, 11 feet in external, and 9 feet in internal diameter; the height inside being also 9 feet. Coal is drawn from the bottom of the draining hoppers into waggons travelling on rails, which are continued on the same level all along the tops of the batteries of beehive ovens. From these the coal is dropped through the "loading eye" in the roof of the oven and levelled through the doorway, which has already been built more than half way up with blocks 9 inches square and 4 inches thick. In these ovens no inner door is provided, as is sometimes done. The charge varies from 2 ft. 9 in. to 3 ft. 6 in. in depth, and is worked off in 48, 72, or 96 hours. The usual charge is about 5¾ tons; and this is allowed 72 hours.

The ovens were seen in all stages of their work; and the visitors plied the guides with questions as to the methods of working, and the points of difference from gas-works carbonization. When the full charge has been put in, the lid of the "loading eye" is closed and luted, and the doorway entirely built up. The damper remains closed, even though not absolutely gas-tight. Steam and gas are now slowly given off; and after about 20 to 30 minutes the gas ignites. As soon as the oven has "struck," the damper is opened and small holes are made in the clay of the doorway for the admission of air. This supply of air is modified from time to time, so as to secure complete combustion of the issuing gases and as high a temperature as possible without allowing any needless excess of the coke to be burned away. Carbonization thus begins at the top and slowly proceeds downwards through the mass. The dense hydrocarbons coming up from the distilling coal pass through incandescent coke, and are decomposed with the separation of carbon in the mass; thus helping to secure the denseness and hardness which are the great features of this coke. As soon as the charge is burnt off and no flames are seen, the doorway is broken down and the coke slaked inside the oven; a special design of nozzle being used on the hose to prevent the water splashing on the hot sides of the oven. The oven floor has an outward fall of some 4½ inches, to carry off the surplus water. Before slaking begins, the damper is shut to prevent steam being drawn into the main flue. The slaked coke remains a little longer in the oven, to drive off any excess of moisture, and is then raked out and loaded into railway waggons on the low-level sidings along each side of each battery of ovens. The oven, as now ready for the next charge, is at a dull-red, hardly visible heat. On an average this coke contains less than 1½ per cent. of moisture.

By this method not only are all the bye-products lost, but a certain amount of the coke (10 per cent. on an average) is consumed. A few years ago, Mr. Darby estimated that this loss represented 1,000,000 tons of coke, and 200,000 tons of sulphate of ammonia, besides the tar products and surplus gas, all of which would be saved by the use of recovery ovens. On the other hand, many iron-masters contend that the beehive oven coke is better and more economical than that made in recovery-ovens. At first, this objection was probably well founded; but experience in the use of the recovery-ovens, and the development of improvements in their construction and working, now produces a coke practically equal to, and even denser than, that made in the beehive ovens. Here, at Thornhill, the former yields a good, steel-gray lustrous coke; whereas many of the earliest types of plant gave a dull-black coke.

A move was afterwards made to the recovery plant. This consists of two batteries of Simon-Carvès ovens (1906 patent) fitted with Siemens regenerators. There are forty ovens in all, each 33 ft. long, 8 ft. 2 in. high, and tapering from 22 in. to 20 in. in width. The charge is about 7 feet deep, consists of 7½ to 8 tons, and is worked off in from 36 to 40 hours. Fourteen ovens are dealt with in each shift, in 9 to 10 hours really. The coal is fed through three openings in the roof of each retort, and is finally levelled, but not compressed, by a patent device worked by the discharging machine through an opening in the upper part of the door, which, like all the other openings, is finally luted up. When the charge in an oven is fully carbonized and all gas expelled, the anti-dip (a mushroom-shaped valve) is let down on its face across the dip-pipe, the lid taken off the ascension pipe, and all the thick tar, &c., removed. When ready for discharging, one or more charging lids are opened, the two oven doors lifted vertically clear of the opening, and the coke pushed out by a ram (worked by a 35-H.P. electric motor), which travels on rails the whole length of the batteries. Temporarily fitting up to the discharging end of the oven is a Darby slaking shield, from which many jets of water play over the issuing coke from all sides, like a needle bath; and, in addition, as it falls down the slope hose-pipes play on it. Even when thus slaked the coke averages only 2½ per cent. of moisture.

Some of the ovens are fitted with the patent door devised in 1905 by Mr. T. Beach, the Manager of the Saydale Collieries and Coke-Ovens, near Pontefract. This door is lined with specially-designed fire-clay blocks with perforations, which form a vertical zig-zag flue up the door. At the base is an external gas-admission aperture, and at the upper end an external escape port. By burning gas in the flue, the portion of the door which is in contact with the coal is rendered incandescent, and the end portion of the charge is thus as completely carbonized as the rest. Ordinarily a "block-end" of "seconds" coke is produced; resulting, in the case of the ovens under the patentees' care, in an annual loss of £10 5s. 9d. per oven. Some of this "block-end" coke was seen, which had been formed against the ordinary doors. It was, of course, being picked out and put aside by itself, while the other coke was being shovelled into railway waggons. It was natural that the visitors should promptly name it "Coalite." In addition, a hard, clean face of coke is a great advantage for the ram to push against, especially if the sides of the oven are rough and irregular from long use, and resistance is thus offered to the moving coke. The consumption of gas amounts to 1 cubic foot in 50 seconds for each door, and it is delivered through a ½-inch tap. Each of the ports for this gas is provided with sliding-doors, to exclude air and prevent cooling while the oven is standing, and also to allow of the door being used as a solid door if the supply of gas is deficient.

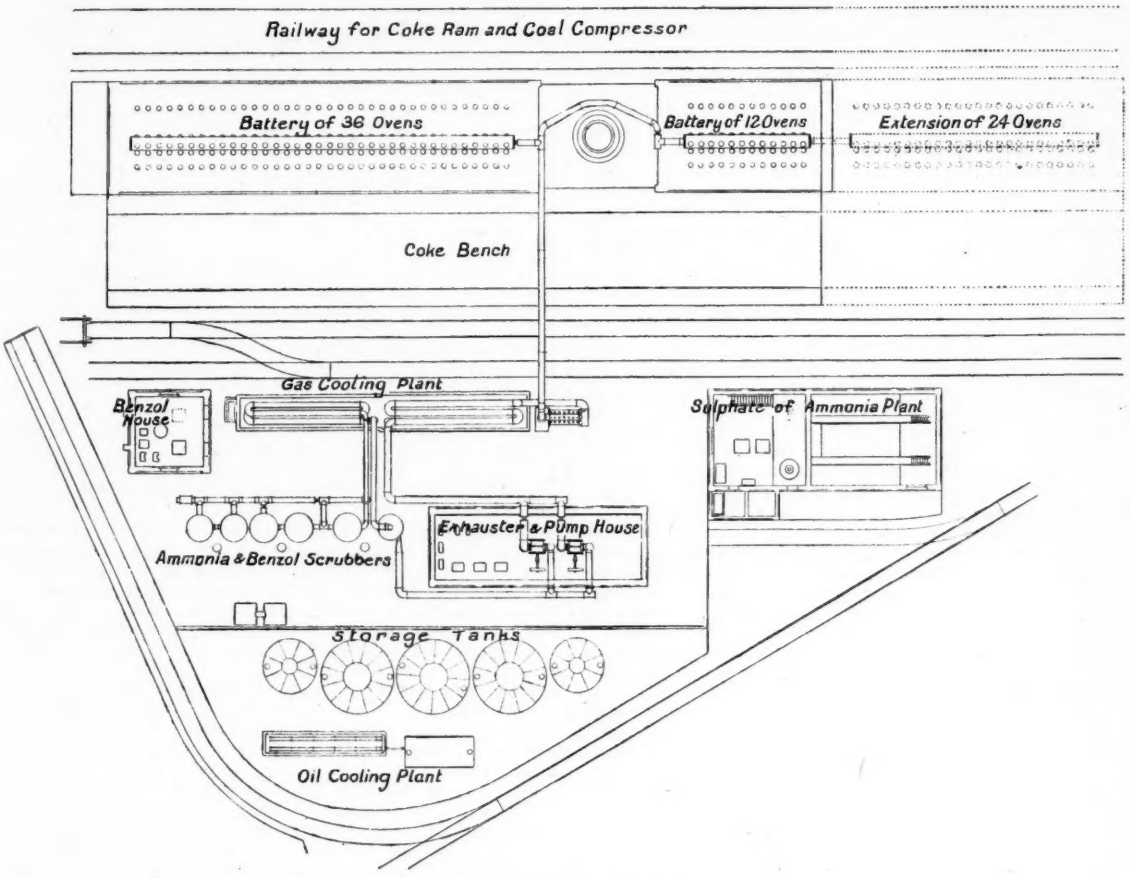
The ovens are gaseous-fired and consume about 55 per cent. of the gas yielded by the coal. Under the whole length of each battery are four tunnels, the middle two open to the air, and the outer ones (4 feet high) filled with a chequer-work of bricks. Along one the air for the combustion chambers is drawn, after having first travelled the length of the open passages and been warmed there; while the other is the waste-gas flue. Gas is brought along a main on each side of the batteries, and down by a vertical branch to a small distributing-box placed between and below each two ovens. From this five channels, each provided with an external tap, lead the gas into five chambers extending altogether halfway through the bench, and each communicating upwards into three flues. Air is admitted from the regenerator into five chambers under the sole of the oven, each opening into one of the five gas-chambers. One speciality of the recent type of Simon-Carvès ovens is the ease with which the air supply to each part can be regulated, and consequently the temperature of the entire oven controlled. This is effected by taking out a special luted-in tile, and partly closing up the entrance to the air-ducts, which all issue from a main channel just behind the front wall of the setting. The flames play up the 15 vertical gas-flues, along a horizontal flue, and down 15 more vertical flues on the opposite side into the five chambers below the sole of the oven, and thus to the main flue. As in a gas-works regenerative setting, the supply of air is adjusted till the tips of the flames reach just short of the regenerator flue. Unlike it, however, when once adjusted the length of these flames will not alter much, as here the supply of gaseous fuel is nearly constant in volume and pressure, and does not vary with the depth of fuel and the amount of clinker in a generator. The construction of each side of the bench is similar, and each half hour the working is reversed. By the operation of a winch at the battery end, the chimney dampers and those regulating the entry of air are simultaneously changed; and by two quick-change valves the supply of gas is cut off from one side and given to the other. The air is now delivered along what before had been the waste-gas travels, and the spent gases warm up the chambers and passages that previously had been giving up their heat to the incoming air. Through spy-holes the members could see the various ducts, and by having the gas-taps turned off and on again they were able clearly to see the course of the flames, and could thus realize the arrangement of the heating-flues. The main gas-tap at each distributing-box is a three-way tap, one way opening to the air, so that occasionally (say, for half-an-hour each day) the gas can be cut off, and air drawn in to burn off any soot deposited in the heating-flues as a result of the incomplete combustion of a fairly rich gas.

In passing round during the inspection, the members caught casual glances of the discharging of retorts, and again at the close all the parties met and watched the complete operations of discharging, charging, and levelling of the charge being carried out. It was pointed out that the slaking is not excessive, and that the coke is not made absolutely cold. Thus any very great excess of moisture in it is avoided; the average being 2½ per cent., as against 1½ per cent. in beehive-oven coke and 5 per cent. in gas-works coke. The fine colour and lustre of the coke—almost undistinguishable from the beehive product—is largely a result of rapid cooling. The coke is not screened, but is shovelled direct into waggons; the breeze only amounting to just over 1 per cent., and is sold as such. These ovens yield 15 cwt. of coke per ton of coal (calculated as dry coal); the beehive ovens about 12 cwt. The Thornhill coal is not only a gas coal, but eminently satisfactory coking coal, and its coke is in high demand.

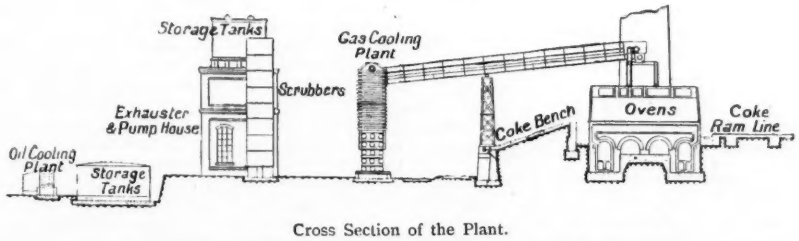
The gas leaves each oven by one ascension pipe, about 12 feet long and 10 inches in diameter (placed about one-third of the length of the retort from one end), and passes by a very short dip

pipe into a very large dry main. In this the temperature is too high to allow of any water vapour condensing, and from it tar and gas travel together to the first of the condensers, at the entrance to which the tar falls into a seal-pot. A continuous stream of thin tar is pumped up from the decantation tank and passed along the main. This helps to flush down the heavy tar, which work is assisted by men pushing it along with rods inserted through openings in the flat top of the main. While standing on top of the ovens, the visitors were able to study the simple, but effective, arrangements for lifting the oven doors, the various gas-supply mains, the anti-dips, &c. Considerable interest was excited on looking down the ascension pipes that happened to be open, in seeing how clear of obstructions they were. In gas-works practice, great emphasis is laid upon the steady maintenance of a predetermined reading of a gauge on the hydraulic main, because of the effect on the illuminating power of the gas. Here, where this property of the gas is of no consequence, no such minute care is taken—no gauge is even fitted on the main, and the only guide to the man in charge of the exhauster engines is that on the dry main of each battery is a stand-pipe at which a jet of the crude gas is burning; and he is instructed so to work his exhausters as to keep this flame down to a length of about a foot.

The first portion of the condensing plant consists of 21 5-inch gilled vertical pipes. The visitors soon came to see that gilled radiators were a very frequent feature of all cooling processes here. This is followed by a serpentine of horizontal pipes of about 15 inches diameter cooled by water dropping over them. Over the serpentine is a water-cooling tower built up of wooden grids. The water that has passed over the serpentine is pumped at once by two Tipton pumps to the top of the tower, and on its way down is cooled by the air and then again passed over the pipes of the serpentine. By this means the quantity of water needed is reduced to a minimum—only enough being added to make up for what is evaporated. The gas then passes through two Bryan Donkin exhausters, which work in duplicate and are driven by vertical steam-engines coupled direct. Next in sequence



Plan of the Coke-Oven Plant.



Cross Section of the Plant.

Simon-Carves Coke-Oven Plant at Ingham's Thornhill Colliery.

is a very large "Cyclone" tar-extractor, where the heavy tar fog and water are thrown out; so that in further cooling the lighter hydrocarbons may have fuller opportunity of dissolving out the naphthalene. In it, the gas is also subjected to a spray of tar. The gas is further cooled by means of a second serpentine similar to the first. At first sight the condensers seemed to be large, more especially considering the assistance that is given by water and the gilled radiators, until one was reminded that every day from $2\frac{1}{4}$ to $2\frac{3}{4}$ million feet of gas pass through them—and this without much preliminary cooling in hydraulic or foul mains.

The gas now passes through five board-filled tower-scrubbers. Three are devoted to ammonia recovery; and the gas is scrubbed successively with strong liquor, weak liquor, and clean water. In the remaining two, it is treated with creosote oil in order to wash out the benzol vapour. As the tar is not distilled on these works, but sold, the great problem is to make as much benzol as possible —to leave a minimum in the tar and to recover all the remainder from the gas. Many of the special features of the mains and condensers are designed with this object in view.

The gas is next passed to the ovens and boilers to be burned. About 55 per cent. of the total is used under the ovens; and in their gas-mains a pressure of 57 millimetres (about $2\frac{2}{10}$ inches) is usually maintained. The gas passes through a Braddock's governor, on the inlet of which a pressure of 4 inches is steadily kept by passing all the surplus gas to the boiler through a governor with reversed cone—any fluctuations of supply thus only affecting them. The heat of the waste gases coming from the beehive ovens is also utilized in raising steam. So much steam is required about the colliery for its general working, for generating electricity for the mine, for the recovery plant, &c., that these two sources of heat are not adequate, and a certain amount of small coal and breeze has to be consumed.

The ammoniacal liquor is worked up to sulphate of ammonia in the usual way. The plant, which is from Simon-Carvès' designs, has a capacity of 70 tons of liquor per day; and, like the rest of the plant, works 24 hours a day for seven days in the week. The stills are rectangular, and the liming-chamber is fitted with a Simon-Carvès speciality for thoroughly churning up the lime and liquor. The superheater is somewhat different from usual types; the gases passing through gilled pipes with the water circulating outside them. The spent liquor passes off through a float valve, runs through four settling tanks, and part is finally used for mixing with the lime. There are two solid-lead saturators with gun-metal bottom discharge valves. Lead-lined draining tables are provided; and the saturators are so made that the salt may also be fished out from above, as in an ordinary open saturator. The salt is finally dried in an under-driven centrifugal machine, the perforated steel cage of which can be lifted out bodily and swung into the stores to empty. The acid is first stored in a 20-ton capacity tank; and then, by a continuous elevator, it is blown to a high-level 5-ton tank. The mother liquor that drains from the sulphate made is collected in crystallizing tanks, where it is allowed to cool, and the deposited salt fished out, before it passes to its own storage tank. The waste gases, when quite cooled down, are passed to the foul-main, and eventually burned under the ovens and boilers.

The benzolized creosote from the scrubbers is treated with a view to the recovery of crude benzol from it. It is first heated up by a superheater, and then passed down a continuous still closely resembling a sulphate still. As it flows down from tray to tray and meets steam and hot vapours rising from the lower trays, all the benzol is gradually expelled. These vapours now pass through a dephlegmator, consisting of vertical gilled pipes, where the vapours of liquids having a comparatively high boiling point condense out and are drawn off, cooled down, and their naphthalene thus removed. The remaining uncondensed vapours are then led to a Woulffe's condenser—10 horizontal pipes having the gas passing along an annular space with air outside and water inside—where they are completely cooled, and the water and benzol finally allowed to separate out. The benzol is sent to a large storage-tank, ready for sale. It is sold as crude benzol, 60 per cent. distilling over at 120° C. In the lower part of the benzol still, the descending oil, which is mainly de-benzolized creosote, is treated with dry steam, so as to expel all water. In the upper part of the still, wet steam is used when any more is needed. This hot creosote is then run out, passed through a water-cooled gilled condenser, and stored for use again.

A striking series of above-ground storage-tanks for liquors, tars, oils, &c., are placed along the bottom of the recovery plant; while over the exhauster-house and laboratory are large tanks for benzol and tar ready for sale, and another containing strong ammoniacal liquor for the neighbouring sulphate plant. Shale from the hillside is worked up into common building bricks. The plant was standing for the week-end, and time did not permit of its inspection. All the colliery buildings, chimneys, &c., are constructed with these home-made bricks; but no external trade is done in them just now. The under-clay of the coal is not worked here, but on the other side of the river; fire-clay is worked by the same management, and made up for general gas-works requirements.

The officially given statistics of the results of the last six months' working are as follows; the bye-products being calculated on the dry weight of the coal supplied to the ovens:—

Coal carbonized per day		225 tons.
Coal (dry) charged per oven averages		7 tons 7 cwt.
Sulphate of ammonia	per ton of coal	32·43 lbs.
Tar		10·003 gallons
Benzol		3·32 gallons

The production of gas is probably between 11,000 and 12,000 feet per ton; but no means exist for accurate measurements.

On the conclusion of the visit, the visitors had tea (provided by Messrs. Inghams, Limited), at a neighbouring hotel. At its close, the firm and officials, as well as those of Messrs. Simon-Carvès, who had been the guides of the party, were very cordially thanked by Mr. J. H. Hill, Mr. H. Butterfield, and Mr. Garlick on behalf of the two Associations. Mr. Edward Allen, in supporting the resolution, thanked the speakers for their kindly and flattering references to himself as honouring them with his presence. He assured them that he felt highly gratified at having been made an honorary life member of the Manchester and District Junior Association, and thereby having the opportunity of joining them on so valuable and interesting a visit. He had a very keen interest in coke-ovens, was closely watching their developments, and had gladly embraced the chance of seeing a Simon-Carvès plant with all the most recent improvements. Twenty years ago, we seemed to have settled down very comfortably to horizontal retorts served by the machines then in use as marking the end and limit of gas-works development in the carbonizing department, when suddenly the introduction of inclined retorts startled them out of their easy satisfaction; and now, with the many experimental and actually accomplished new methods of carbonization, all seemed in the melting-pot, and one hesitated to say what the future would show. He cordially associated himself with all that had been said about the kindness of the management and the hearty willingness of all officials to make the visit an unquestioned success. The effective reference Mr. Allen made to the great hunting song "D'ye Ken John Peel" called forth hearty applause, as Mr. John W. Peel, the General Manager, had been conspicuous for the genial wholeheartedness with which he had thrown himself into the work of the afternoon, and the unstinting readiness with which he had given time and attention to all the preliminary arrangements. Mr. Peel suitably replied, and so brought to a close an enjoyable and most instructive day's outing.

SOUTH-WEST OF ENGLAND GAS ASSOCIATION.

Meeting at Taunton.

The Second Meeting of the newly formed Association of Gas Managers for the South-West of England, was held last Thursday afternoon at Taunton—Mr. J. Hughes Cornish, of Bridgwater, being voted to the chair.

The following gentlemen were also present: Messrs. A. S. Brook (Chard), the Hon. Secretary of the Association, Philip Thomas (Wellington), J. A. Gray (Teignmouth), F. Chalmers (St. Mary Church, Torquay), W. S. Walker (Budleigh Salterton), W. L. Copp (Axminster), A. W. Chalmers (Minehead), Thos. K. Ponsford (Wiveliscombe), J. Handel (Ilminster), J. Harger Pye (Clevedon), and A. E. Tulk, Highbridge.

It will thus be seen that the gathering was a fairly representative one of Somerset and Devon. Telegrams and letters of regret at inability to be present were read from the Gas Managers at Yeovil, Wells, Tiverton, Ilfracombe, Exmouth, and Sherborne—all heartiiy approving of the formation of such an Association, and anticipating that good would result to those concerned. The minutes of the first meeting held in February last were adopted. Members were then invited to give expression of opinion as to the benefits or otherwise of such an Association.

In the discussion which followed, the Hon. Secretary stated that since the first meeting there had been an interchange of information among them with regard to stocks and prices of coke, tar, &c., with beneficial results. The suggestion now was as to whether they should keep to the discussion of commercial subjects or go in for the reading of papers at their meetings. The Chairman pointed out the advantage of getting Bristol and Bath to co-operate with them so as to obtain the price of coke ruling at Bristol, where it was now 16s. 6d. per ton f.o.r. He believed that if these gentlemen were approached, they would give such information each week to the Association, which might help them immensely. They could get the particulars second hand; but they would rather have them from headquarters. If the information could be obtained, it would be of immense value to them in their returns. Mr. Gray suggested that it would also be advantageous to get similar information as to the ruling price of coke at Plymouth and Exeter. After further discussion, it was decided to leave the question of approaching the Gas Managers in the towns mentioned to Messrs. A. S. Brook, E. Howell, of Yeovil, and the Chairman of the present meeting, who, it was hoped, might be able to talk over the matter when they all met at the forthcoming Institution gathering in London.

It was agreed that the Association should represent the counties of Somerset, Devon, and Dorset—Cornwall being considered too distant to expect members to come from so far, or for the Association to hold their meetings there, even occasionally.

On the question as to the advisability of reading papers, opinions were somewhat divided; and in the result, on the proposition of Mr. Gray, seconded by Mr. Thomas, it was carried that the Association be run on informal lines, and that subjects for discussion should be introduced by way of a "Question Box."

The election of Mr. Brook as Hon. Secretary was confirmed. Mr. Howell, of Yeovil, was unanimously elected Chairman of the Association for the ensuing year, and Mr. Cornish as Vice-Chairman—the latter saying that he would be very willing to act with Mr. Howell, and acknowledged his great experience in gas affairs. It was decided to keep to 10s. 6d. as the yearly subscription of members, and that three meetings be held a year—in the last weeks of February, July, and October. The next meeting was fixed to take place at Yeovil.

After one or two questions had been discussed in Committee, the proceedings terminated.

The Lighting of the Windsor Liberal Club.—Our attention has been drawn by several readers to a circular which is being freely distributed over the country setting forth the superiority of the lighting by Osram and Tantalum electric lamps to that afforded by high-pressure gas. It is stated that the lighting of the Liberal Club at Windsor has recently been secured for electricity after a competitive trial lasting over thirteen days, at the end of which the cost for gas (at 3s. 6d. per 1000 cubic feet) was £1 8s. 3d., while the electricity bill (at 3½d. per unit) was only 16s. 2d. It is added that "the general effect of the more distributed light obtained by the Osram lamps was so much appreciated that the whole of the club premises have now been wired for electric light." We are informed, however, that the Windsor Gas Company still light seven-eighths of the Club—the large hall with Lucas lamps, and all the billiard-tables with incandescent burners.

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Sölingen	30	Potsdam	48
Ludwigshafen	30	Berlin—Oberspree	48
Zürich	100	Berlin—Mariendorf	84
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Other Installations are in course of construction as under:—

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Brandenburg a/H.	60	Worms	30
Trieste	20	Potsdam (Repeat Order)	40
Elberfeld	120	Mariendorf (Repeat Order)	72
Frankfort—Bockenheim	120	Charlottenberg	70
Genoa	60	City of Berlin—Danzigerstrasse	240
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SAWER & PURVES.

THE PIONEERS OF THE SLOT METER.

FIRST IN 1889.

FOREMOST 1908.

THE INTRODUCTION OF THE SLOT METER.

WRITING to supplement the information given in our "Questions and Answers" column last week with regard to the introduction of the slot meter, a correspondent says that the first patentee was Mr. W. Brownhill, but his meter was never in practical use. The first Gas Company to supply gas in quantity through slot meters was the Liverpool United Gas Company. They supplied gas in bulk to the Corporation for the artisans' dwellings in Casino Street, Liverpool. The Corporation fixed 50 penny-in-the-slot meters in these dwellings. The meters were Thorp and Marsh's patent, and they were manufactured by Messrs. Sawer and Purves. The meters were fixed for six months on approval, at the end of which time the Corporation had to decide whether they were a success or failure. Mr. Marsh entered into a guarantee that the meters should be satisfactory, and he undertook liability for any accident that might occur. Our correspondent adds that he has no hesitation in saying that Sir George Livesey was the first man controlling a gas undertaking to strenuously advocate the use of the slot meter.

GAS v. ELECTRICITY

(From the GAS WORLD.)

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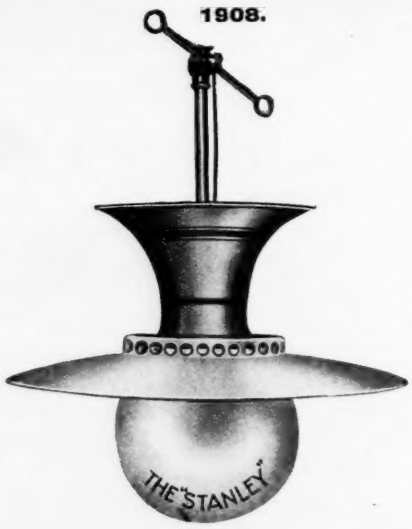

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LONDON AND SOUTHERN JUNIOR ASSOCIATION.

Visit to Southend.

Their search after information on any and every subject that is of interest to them—that is to say, all matters which are connected with the manufacture and sale of gas—took the London and Southern District Junior Gas Association somewhat farther afield than usual last Saturday, when about thirty-five of the members journeyed to Southend. The fixture was a long-standing one, and had been anticipated with considerable pleasure, which the realization proved was amply justified. It was a whole day's outing—the party assembling near the pier at about 11.30; and the fact that so many of the members were able to be present, is an indication that the usefulness of the Association is recognized by those in authority. The programme was one that combined both business and pleasure; and though the business portion would no doubt have been as keenly undertaken in face of the most adverse atmospheric conditions, it must be admitted that the unexpectedly fine weather with which the visitors were favoured had a great deal to do with enhancing the enjoyment of the other portion of the day's proceedings.

It must be considered unnecessary—except perhaps in the case of a railway company's advertisements, or announcements relating to the sale of building land—to explain at this time of day the growing importance of Southend, with, as it may be called, its suburb of Westcliff, as a residential resort. At Westcliff especially the large number of attractive—and (what is important in these days of such frequent over-building) occupied—houses which have lately been erected, is a matter for self-congratulation on the part of those whose material welfare is bound up in the prosperity of the place. Prominently in this connection must, of course, be placed the Gas Company, whose business, as is only to be expected under the existing favourable circumstances, is expanding in a manner that must be most gratifying to the proprietors. It would not, however, be fair in these days of competition, to put by any means all the credit for the advance in a gas company's business down to the growth in population of the district of supply; and much of the success of the Southend Gas Company it is safe to assume is traceable to the energy of the Engineer and Manager (Mr. Francis Clark) and the policy of the Directors in the administration of the business. There is a municipal electricity undertaking, with the usual result that some arc lamps have been erected on the promenade; but how little reason the Gas Company have to be disturbed by such competition as they may have to face in this direction will be gathered from the really remarkable increase that has been taking place in the consumption of gas. Going back to 1890, which after all is not so very long ago, it is found that the make of gas was then 27½ million cubic feet. Five years later—that is, in 1895—the quantity manufactured was 49½ million feet; and by 1900, this had increased to 139¾ million feet. By 1906, the make had grown to 283¼ million cubic feet; and last year it was nearly 322¼ million feet. The first quarter of the present year showed an increase of about 13 per cent. The number of consumers at the end of last December was 10,911, of which 7187 had prepayment meters; and the price of gas to users through ordinary meters is 3s. 6d. per 1000 cubic feet, with discounts.

When the members of the Association had assembled on Saturday morning, a prompt move was made for the gas-works, permission to inspect which had been accorded to them—this item constituting the business portion of the day's proceedings. The works are compactly arranged, and are situated on the sea front, only some few minutes walk from the pier, and in the lower portion of the town, the level of which rises considerably from the pier towards Westcliff. The generally most prominent feature of a gas-works—the holders—is, of course, present; but in this case, on approaching the works from the promenade, the most striking object is a pier which the Company have erected for securing delivery of their coal. The coal is brought to the pier in barges holding from 150 to 250 tons; and it is unloaded and placed in trucks by either skips or a grab. The trucks are drawn by a small locomotive to the coal-store.

When the visitors arrived, they were (in the unavoidable absence of Mr. Clark, senior) received by Mr. Wilfred J. Clark, who acted as guide during the subsequent tour round the works. Starting at the beginning, the retort-house was first inspected. This contains eight beds of eight through retorts, 22 feet long, fired on the regenerative system, and charged and discharged by means of Arrol-Foulis hydraulic machinery, which is installed on both sides of the house. The coke, when drawn from the retorts, falls into the cellar beneath, whence it is removed for use in the water-gas plant or for sale. The greater part is utilized in the manufacture of water gas, and in the furnaces; the quantity sold last half year having been 950 tons, while 8300 tons of coal were carbonized. Six-hour charges are worked. The capacity of the house is about 650,000 cubic feet per day; and in view of the growth of the consumption indicated by the figures above quoted, one would expect to find the Company making arrangements for increasing their output. Such, in fact, is the case; for a start has already been made with the foundations for an extension of the retort-house. In this, some little difficulty has been experienced; but it has been overcome by the driving of piles, on which it is intended to erect a steel building. The maximum output in one day up to the present time has been 1,241,000 cubic feet; so that the Company rely considerably upon carburetted water gas, manufactured in two of Messrs. S. Cutler and Sons' plants, of a capacity of 650,000 cubic feet per diem—the proportion of water gas sent out being about 47 per cent. Last year the amount of unaccounted-for gas was 5·8 per cent.; and in this connection it may be remarked that the gas leaves the works at pressures varying between 3½ and 6½ inches.

There are three holders, the capacities of which are 1,000,000, 300,000, and 100,000 cubic feet; the last-named being used as a water-gas relief holder. Purification is, and has for some years past been, carried out entirely by means of oxide, with satisfactory results. There are eight purifiers under cover, and six in the open air; the only inconvenience experienced with the latter being that the weather may happen to be wet when it is desired to empty them. An object of interest to the members, of which mention should not be omitted, was Mr. Clark's patent tower scrubber or liquor intensifier, by means of which the ammonia in the gas is reduced to a very small quantity. Another point noted was that the Company repair all their cookers (of which there are a large number out on hire) on the works, extensive arrangements having been carried out for this purpose. There is also in operation, it may be mentioned, a lighting maintenance scheme, which is found to answer well.

At the conclusion of the inspection, Mr. W. J. Liberty, who remarked that the President (Mr. W. Upton) had unfortunately been detained in town on business, said they all, he was sure, appreciated very highly the fact that they had been able to visit these progressive works, where an average of 10 per cent. increase in the output was being experienced every year. Mr. Clark senior had said to him: "Come again, but come in the summer time, when we will see if we cannot arrange some little excursion;" and this should be an encouragement to them to return and see the extensions when they were completed. Mr. Winslow then proposed a hearty vote of thanks to the Directors of the Company for giving them permission to view the works, and to Mr. W. J. Clark for taking them round and describing all the apparatus. Mr. J. E. Henwood seconded, and said the visit had been a pleasant one. Such opportunities for interchange of opinions were extremely helpful to them in extending their knowledge. He wished the Company every success. The proposition was heartily agreed to; and Mr. W. J. Clark thanked the members.

Afterwards about twenty of the visitors dined together at the Ship Hotel; and the members then scattered, to spend the remainder of the day as best pleased them.

PRODUCER GAS AND SUCTION-GAS PRODUCERS.

By J. Carter, of Dublin.

[A Paper read before the South-East of Ireland Gas Managers' Association, April 30.]

Producer gas is the term generally given to the gas obtained from the partial combustion of fuel in a generator or closed furnace. If a restricted quantity of air is drawn off, or forced through, a mass of incandescent coal or other carbonaceous fuel contained in a generator, a combustible gas is obtained. If the fuel bed in the generator were shallow and total combustion took place, the resulting gas would be incombustible—viz., carbonic acid. Producer gas is a semi-water gas. The draught through the fire is composed of steam and air.

For the sake of simplicity, I will first deal with the action of a generator working from an air-blast only. The incoming air meets the fuel at the fire-grate and consumes it to carbon dioxide. These products of combustion, rising through a column of incandescent coal, are reduced to carbon monoxide—$CO_2 + C = 2CO$. Air contains four-fifths of nitrogen by volume, which nitrogen is not acted upon at all by the fuel. The gas evolved, therefore, is largely diluted with nitrogen. If all the oxygen in the air admitted were reduced to carbon monoxide, the resulting gas would consist of about 34 per cent. of carbon monoxide and 66 per cent. of nitrogen by volume. The exact quantity of carbon dioxide reduced to carbon monoxide depends upon three factors—viz., (1) The temperature of the furnace, (2) the depth of the fuel bed, and (3) the velocity of the draught.

Temperature.—As is well known, the reduction of carbon dioxide to carbon monoxide absorbs heat; and it naturally follows that with the low temperature less of the carbon dioxide is reduced than with a high temperature. The temperature of the combustion zone is about 2000° Fahr., and the decomposition zone about 1900° Fahr. The higher the temperature of the fuel bed, the greater is the amount of carbon monoxide formed by the action of the carbon dioxide on the carbon. In practice, it is, of course, impossible to convert all the dioxide to monoxide. The amount of carbon dioxide in producer gas is generally from 4 to 10 per cent.

Depth of Fuel.—This has an important bearing upon the time that the carbon dioxide is in contact with the hot carbon. Within reasonable limits, the deeper the fire the greater is the percentage of carbon dioxide reduced to carbon monoxide. In a modern suction-gas producer, the depth varies from 18 inches in a small plant to 36 inches in the larger sizes. Combustible gas can be made with a very shallow fire. I have frequently observed an engine working well with the fire only 8 or 9 inches deep. Such

a practice is not to be recommended, as when fresh cold fuel is fed to the generator, the temperature of the fire falls, and the calorific value of the gas becomes too poor to work the engine at any considerable load.

Velocity of Draught.—The area of the fire-grate in relation to the demands for gas should be such as to ensure that the velocity of the draught through the fire should allow a reasonable time for the reactions to take place. As before mentioned, the reduction of carbon dioxide to carbon monoxide absorbs heat; but naturally it does not absorb the whole of the heat evolved in burning the bottom portion of the fuel to carbon dioxide. About 70 per cent. of the heat is absorbed; and in a producer supplied with air only, the remaining 30 per cent. would be wasted. The calorific value of the gas would necessarily be low—from 90 to 100 B.Th.U. The high temperature would fuse the ash into hard clinker, and interfere with the regular working of the plant; and as the gas would have to be cooled to 65° Fahr. for use in an engine, the thermal efficiency of the plant would not be high. The addition of steam to the air blast enriches the gas, keeps the temperature of the generator within practicable limits, prevents the formation of hard clinker, and preserves the fire-bars. The conditions necessary for the reaction of steam and hot carbon are the same as those required for air and carbon. The oxygen of the steam unites with the carbon of the fuel and forms carbon monoxide, and the hydrogen is freed. The gas is enriched by the addition of hydrogen; and the calorific value of the gas is raised to about 140 B.Th.U. The combustible gases from an average plant are composed of: Carbon monoxide, 20 per cent.; hydrogen, 19 per cent.; marsh gas, 1 per cent.; and the remainder is nitrogen and carbon dioxide.

Types of Gas-Producers.

Up to within recent years, the only kind of producer on the market was the pressure type. This plant consisted of boiler, generator, scrubbers (coke and sawdust), and holder. Steam had first to be raised in the boiler to about 60 lbs. pressure. The steam blowing into an injector at the side of the generator drew in with it a quantity of air. The pressure forced the resulting gas through the scrubbers, &c., to the gasholder. The first cost of such a plant is rather high, constant attendance is necessary, it occupies a comparatively large space, and is in practice not so economical as a suction plant.

Suction Type.—In this type the boiler and gasholder are dispensed with, the space occupied is greatly reduced (the space occupied by a 100-H.P. plant, including working room, is only 14 ft. by 13 ft.), the capital outlay is less, less attention is required, and the fuel consumption is much reduced. The outstroke of the engine on the suction stroke of the cycle draws in a charge of steam and air through the generator, and draws the gas thus made through the scrubber and pipes to the engine.

Description of the "National" Suction-Gas Plant.—The complete plant consists of: (1) Gas-generator, (2) gas outlet-pipe and water seal, (3) scrubber, (4) gas-main, (5) expansion box under engine. The generator is constructed of cast-iron, and is divided into two portions—(*a*) the furnace, and (*b*) the vaporizer and coal pre-heater. The furnace is lined with fire-brick carefully jointed; and the space between the cast-iron shell and the fire-brick is filled with a non-conducting material to prevent radiation. This furnace contains the fuel to be gasified. The fuel rests upon the fire-bars. A space is left under the fire-bars for the ashes. The bottom of the generator is hollowed out to a depth of 3 inches, and the unevaporated water from the vaporizer flows down the steam and air pipe into this well. An overflow pipe takes away any excess of water to the water seal. The object of having this small supply of water at the bottom of the generator is that the steam arising from it preserves the fire-bars and prevents their being burnt out.

The charge of gas, on leaving the fuel, is caused to circulate around the coal-hopper and the ribbed vaporizer before entering into the gas outlet-pipe. A metal plate at the bottom of the hopper prevents the gas taking a direct route to the gas outlet-pipe. The object of causing the gases to follow this devious route is to recover as much as possible of the waste heat from them. By circulating round the bottom of the fuel container, the coal in it is gradually heated; so that, as the fire subsides, the fresh coal taking its place is hot. By causing the gases to come into contact with the vaporizer, the water admitted into the outer portion of the vaporizer is converted into steam, the air admitted into the vaporizer is raised in temperature, and the mixture of steam and air is to some extent superheated. Still further heat is abstracted from the gases while they are passing through the gas outlet-pipe to the scrubber. A double pipe is fitted into the down portion of the gas outlet-pipe. The cold water supply to the vaporizer is fed into the inner tube, rises through the outer one, and trickles into the vaporizer as hot water. The gas outlet-pipe is also jacketed for the pre-heating of the air. The cold air is sucked in at an opening at the bottom of this jacket, and circulates round the ribbed hot gas-pipe. It then enters the vaporizer as hot water. The gas, now considerably cooled (to about 600° Fahr.), enters the scrubber through the branch of the gas outlet-pipe, where it is washed and cooled to 65° Fahr. The hot air in the vaporizer is further heated, becomes laden with moisture, and passes down the pipe to the fire-grate. The gas outlet-pipe itself terminates in a water seal, into which the heavier portion of dust and grit carried by the gas falls.

The Scrubber.—This is a wrought-iron cylinder filled with coke. Water, fed from a rose at the top, percolates through the coke, and then flows away into the water seal. The cooled and cleaned gas, after passing through the scrubber, goes along the gas-main to the expansion box. The engine sucks its gas from this box; and the partial vacuum caused by the lowering of pressure in the box and gas-main causes the air to be drawn in the admission pipe on the generator, and makes a fresh charge of gas, as previously described.

Effect of Gas Making on the Power of the Engine.—The extra work thrown on the engine in gas making is not so much as would at first sight appear. From tests taken, it is found that the power required is only about ½-H.P. on a 20 B.H.P. engine. This figure naturally depends upon the design of plant, the condition of the generator and scrubber, and the length and number of bends on the gas-main. With a well-designed and properly erected plant, there is no reason why the above-mentioned figure should be exceeded. Engines working on suction gas give slightly less power than when working on pressure producer-gas plants. This difference of power is accounted for by the fact that pressure gas is usually richer (150 to 160 B.Th.U. per cubic foot), and that the engine is able to draw in a great quantity of gas per stroke. The average pressure at the various points in a suction plant are as follows:

Gas-pipe at engine cock	6 to 8 inches of water
Top bend from scrubber	5 to 7 ,, ,,
Gas admission pipe from generator to scrubber	4 to 6 ,, ,,
Steam and air pipe of generator . .	½ inch ,,

These gauge readings should be taken periodically by every gas-plant user. If the gas-main, owing to the use of coal containing tar, gets choked, the gauge would show it. If the coke in the scrubber gets dirty (preventing the free passage of the gas), this stoppage would also be shown by the gauge; and so on throughout the whole system. Neglect of these points causes a lowering in the power of the engine and other difficulties in working.

Fuel.—A large majority of the suction-gas plants at work burn anthracite coal. An increasing number are now using coke, on account of the present high price of anthracite. If coke can be obtained at a reasonable price and of good quality, there is no reason why this fuel should not be generally employed. It seems to me that this question should be taken up by the gas managers of the country. The demand for coke for domestic purposes falls off during the summer months; but if this new outlet could be fostered, the gas plant demands would be the same all the year round. The coke should be free from tar, and should be broken up, either at the gas-works or by the consumer, into small pieces of about 1-inch cube. The coke should contain as little ash as possible, and be screened free from dust.

Tar.—No thoroughly reliable suction plant capable of burning bituminous coal has up to the present been put on the market. Many types of plants have been patented, the majority of which are intended to work with a down-draught—*i.e.*, the combustion zone is at the top of the plant, and the gas is drawn down through the fire and out at the bottom. The object of this is to pass the distilled gases through the hot fire and so fix the hydrocarbons. This very attractive theory works well up to a certain point; but in practice it does not go far enough. Only about 30 per cent. of the tarry vapours are fixed; the remainder having to be washed out. A suction plant built on these lines is too costly, and requires too much attention; and the liability for engine troubles is so great that none of these plants have been put down in this country. A slight percentage of tar in the fuel very quickly tars-up the gas-valve and stops the engine. It is therefore essential that the coke should, as far as possible, be free from tar. Should trouble be experienced from this cause, a small impact tar-extractor should be fitted to the gas-main. The cost of this is not much; and it effectually frees the gas from tar.

Ash.—A certain amount of trouble is also experienced from a fuel containing a high percentage of ash. The high temperatures in the generator tend to cake the ash into hard clinker. This clinker adheres to the side of the generator and prevents the fuel in the coal-container from falling down to take the place of the fuel consumed, and so forms hollow spaces or holes in the fire. These holes in the fire diminish the quantity of incandescent fuel with which the carbon dioxide comes into contact, and the percentage of carbon dioxide in the gas supplied to the engine is abnormally high. In bad cases, unless the ring of clinker were broken down, the engine would stop. With a hollow fire, unconsumed air may be drawn through the fuel bed and burn the gas at the top of the fire. If reasonable precautions are taken, no difficulty should be experienced in working with coke, even if the percentage of ash is high. It will be realized that a fire of coke offers less resistance to the draught than an anthracite fire. The strength of the suction should therefore be diminished. The strength of the suction through the generator is governed by the air-admission cock on the engine. The piston of an engine working from town's gas draws into the cylinder on the suction stroke a mixture composed of one part of gas to seven parts of air. A suction-gas engine takes about an equal amount of gas as air. As the resistance to be overcome is greater with an anthracite fire, if the air supply to the cylinder is partially throttled the strength of the suction through the generator will be increased. The same position of the air throttle with a coke fire would cause the temperature of the fire to get too high; and to a certain extent, this would cause the clinker troubles already referred to. If the air supply is opened more, the suction on the gas-pipe is increased.

By this method the heat of the fire is kept normal, and a common cause of complaint with users of coke is removed. The clinker difficulty can be further overcome by giving the vaporizer an increased supply of water. An ample quantity of steam prevents the clinker from getting too hard. In exceptional cases, poking can be resorted to. A bar can be inserted in the coal-hopper, and the arch of clinker broken down. It is much better to abstain from barring if possible, as it disturbs the fire too much.

Dust.—Dust in the fuel is sucked up and chokes the various passages. More frequent cleaning will remedy this; but it is far better to screen the coke.

Consumption of Fuel.—Makers of suction plants usually give the following guarantees of consumption: 1 lb. of anthracite per B.H.P. hour at full load, and 1¼ lbs. of coke of good quality. From these figures it will be seen that a greater quantity of coke is required than coal. The consumption of fuel in a generator depends upon the amount of carbon in the coal. It is obvious that more coke must be used per horse power than anthracite, on account of the greater quantity of ash in the former. The percentage of ash in the best anthracite is from 2 to 4 per cent., and in average quality from 3 to 8 per cent. The percentage in gas coke varies from 8 to 15 per cent., and in some cases is as high as 20 per cent. If 60 per cent. of the coal put into a gas-retort is recovered in the shape of coke, and if the coal contained 7 per cent. of ash, the percentage of ash in the coke would be about 11·6. If the coal contained 10 per cent. of ash, the coke would have 16·6 per cent.

Tests of Suction-Gas Plants.

The only authoritative tests held of suction plants were carried out at the Royal Agricultural Show, Derby, in 1906. These were on anthracite and coke. Twelve different makers competed. The consumptions of the three leading makers were as follows:—

	Anthracite.	Coke.
National	1·04 lbs. per B.H.P. hour	1·21 lbs.
Crossley	1·15 lbs. ,,	1·36 lbs.
Campbell	1·09 lbs. ,,	1·33 lbs.

The consumption of anthracite included one night's stand-by losses.

When working from coke, the comparison of powers given out by the engines were :—

National	99·5 per cent. of power given from anthracite.
Crossley	90·8 ,, ,, ,,
Campbell	88·0 ,, ,, ,,

Comparative Costs.—Assuming that the consumption of coke is 25 per cent. more than that of anthracite, and taking a 50-B.H.P. engine as an example, the comparative costs would be—

50 Brake-Horse-Power per Hour with

Anthracite at		Coke at	
25s. per ton	6·6d.	20s. per ton	6¾d.
30s. ,,	8·0d.	25s. per ton	8¼d.
35s. ,,	9·3d.		

Or one pennyworth of coke, at 20s. per ton, will give 7⅛-H.P. for one hour; and one pennyworth of coal, at 30s. per ton, will give 6¼-H.P. for one hour. The same engine working from town's gas would consume 14¼ feet of gas per brake-horse-power-hour. The cost per hour for gas at the following prices would be: At 2s. 6d., 1s. 9¾d.; at 3s., 2s. 2d.; at 3s. 6d., 2s. 6d.; at 4s., 2s. 11d. To the cost of working an engine from suction gas must be added the increased attendance necessary and the cost of water used in the generator and scrubber.

Cost of Generating Electricity.—(1) With town's gas, (2) with suction gas.

Town's Gas.

Coal gas at	2s. per 1000 feet	equals 0·55d. per unit.
	2s. 6d. ,, ,,	0·69d. ,,
	3s. ,, ,,	0·83d. ,,
	3s. 6d. ,, ,,	0·96d. ,,
	4s. ,, ,,	1·10d. ,,
	4s. 6d. ,, ,,	1·26d. ,,
	5s. ,, ,,	1·38d. ,,

Suction Gas.

Coke at	20s. per ton	equals 0·21d. per unit.
,,	25s. ,, ,,	0·25d. ,,
,,	30s. ,, ,,	0·31d. ,,

(not including interest or depreciation or labour).

Average Analyses of Suction Gas.

Hydrogen	16·2 per cent.
Carbon monoxide	21·0 ,,
Light carburetted hydrogen	1·3 ,,
Carbon dioxide	8·5 ,,
Oxygen	0·2 ,,
Nitrogen	52·8 ,,
	100·0

142 B.Th.U. per cubic foot.

(*By Dowson.*)

	Anthracite.	Coke.
Hydrogen	15·64	13·20
Light carburetted hydrogen	1·16	0·35
Carbon monoxide	20·13	25·30
Carbon dioxide	6·09	5·40
Oxygen	0·74	0·60
Nitrogen	56·24	55·15
	100·00	100·00
Total combustible gas per cent.	36·93	38·85
B.Th.U. per cubic foot	135·3	136·2

Attendance.—A town's gas-engine can be started immediately if provided with electric ignition, and in two to three minutes if fitted with an ignition-tube. The attention required through the day is naturally small. The suction plant requires more attention. From ten to twenty minutes are required in the morning to blow-up the fire before the engine can be started, and the coal has to be fed to the generator about every two hours. Once a week the generator requires to be cleaned out—an operation which takes from two to three hours, depending upon the size of the plant. On a plant of 50-B.H.P. the necessary attention averages about three hours per day. In many cases the attendant can do other work during the time he is not occupied with the plant. If this is not possible, then the whole cost of his time must be charged to the working expenses of the plant. The cost of this per brake horse power on a 50-B.H.P. engine and for a 60 hours' week, man's wages 20s., would be 0·08d. per brake-horse-power-hour.

Water for Generator.—A very small quantity is required for this purpose. A 50-B.H.P. would consume 30 gallons per week for the vaporizer.

Water for Scrubber.—From one to two gallons per brake-horse-power-hour is required for cleaning and cooling the gases. The exact amount depends on the type of plant. Taking the consumption at 1½ gallons, a 50-B.H.P. plant would require 4500 gallons per week. The total consumption of water would be 4530 gallons per week of 60 hours—say, 5000; and this, at 6d. per 1000 gallons, would cost 2s. 6d., or 0·01d. per brake-horse-power-hour.

Discussion.

Mr. R. B. Anderson (London) thanked the reader of the paper for concentrating the attention of members on the possibilities of the producer-gas business for coke. The price of anthracite was now so high that he thought gas managers should go to some trouble to screen and break their coke to the requisite size. He understood there existed some prejudice against the use of coke. This he thought was in a great measure the result of makers of suction-gas plant always advising the use of anthracite; people had become possessed of the idea that no other fuel would do. He hoped the paper and discussion would be the means of opening a new field for coke in their respective districts.

Mr. J. F. Tyndall (Wicklow) said that on two occasions he had endeavoured to catch the suction-gas fuel trade with coke, but each time had failed through prejudice on the users' part. He had decided, so far as prices at small works were concerned, for regular and constant loads, to "throw up the sponge," for the use of coal gas, and try to cultivate instead the employment of coke for suction-gas plants. One user of such a plant two miles out of Wicklow paid for anthracite 40s. per ton delivered; and though he (Mr. Tyndall) had offered picked coke free from tar at 21s., he could not induce the user to try it. There appeared to be a seated prejudice against coke, owing to a short trial made some time back on a portion left over from filling the scrubber, and afterwards lying out in the open, exposed to all weathers. Complaints were made of excessive heat in the generator; and perhaps Mr. Carter would explain in his reply whether or not this was a local difficulty, and could be overcome.

Mr. J. G. Tooms (Waterford) thought the paper very interesting to gas managers, as showing yet another outlet for their coke; but he certainly was of opinion that whatever extra cost was entailed for screening, should be added to the cost of the material. Even then he thought that with present anthracite prices they would be able to compete favourably. He looked for a certain amount of business with gas-engines for intermittent use, even with gas at 3s. per 1000 cubic feet; and the figures contained in the paper would prove very useful for reference. He assumed Mr. Carter had given them figures for suction-gas plant costs for fuel only; but, of course, water, attendance, oil and waste, and plant depreciation and repairs had to be added.

Mr. J. Paterson (Queenstown) thought the paper an admirable one, as indicating a direction in which gas managers might open up a coke sale business. He, however, had no users of suction-gas plant in his district, and had a good present outlet for his coke; so that he was not inclined to entail any outlay on special screening plant to deal with a very problematical demand.

Mr. T. Hornby (Mallow) asked if there was any difficulty in adapting suction-gas plants for the use of coke. He thought it would be a profitable undertaking to cater for this class of business, even at some extra trouble.

Mr. G. Lennon (Dungarvan) asked if peat was ever used in these producers, and expressed the opinion that it would be extensively employed for the production of fuel gas in future.

The President (Mr. D. W. Tooms, of Fermoy) briefly summed up the discussion; pointing out that the comparative prices and analyses of gas contained in the paper would prove very useful for future reference.

Mr. Carter, in replying to the discussion, said the primary object he had in view when writing his paper was to interest gas managers in the possibilities of coke fuel in place of anthracite for suction-gas producer plants. With regard to the case mentioned by Mr. Tyndall, he had ascertained the conditions of the experiment on a small scale carried out at Rathnew, and had found that the state of the coke and the method of handling the plant were not conducive to good results. He and Mr. Tyndall offered to spend a day or two on the plant in carrying out a coke experiment. He estimated that the use of coke would put at least 10s. per week into the pocket of the owner of the plant. He assured Mr. Paterson and those members who thought

that any very expensive screening plant was necessary, that this was not the case. It was, indeed, coke which was very easily prepared that was necessary; and even an occasional patch of tar was not a serious drawback. Replying to the remarks of Mr. Hornby, Mr. Carter said that no adjustment whatever of the generator was needed in order to use coke. He might inform Mr. Lennon that peat had been, and was being, experimented with in connection with these producers, but with no very promising results up to the present.

A vote of thanks having been accorded to the author for his paper,

Mr. CARTER, in acknowledging it, said he was pleased that the members had found something of interest to them, and he was well satisfied.

MEASUREMENT OF LIGHT AND ILLUMINATION.

A lecture of much interest was delivered yesterday week, at the Municipal, Building, and Public Health Exhibition at the Agricultural Hall, by Mr. J. S. DOW, B.Sc., on the measurement of light and illumination. It is a big subject; and there was not much time at his disposal. But Mr. Dow endeavoured to make his lecture interesting and instructive even to those who have not been initiated into the mysteries of photometry. Mr. LEON GASTER presided.

In his opening sentences, Mr. Dow remarked that Mr. Gaster in his lecture the previous Wednesday dealt with the importance of illumination and the measurement thereof, both to the municipal authorities who are responsible for the lighting of our streets and public buildings, and to the general public for whose benefit this illumination is intended.

Proceeding, he said: The feasibility of studying illumination in the manner referred to depends primarily upon our ability actually to test and measure our illuminants, and to estimate the effect they produce in a commercial way. In my lecture to-night, I shall try to describe briefly some of the recent developments in the subject of light measurement. Naturally, in the time at my disposal I can only hope to touch, in a general fashion, upon a few of the most important aspects of the subject; and I must ask your indulgence if I occasionally pass over points on which you may wish to hear fuller details, or dwell upon others with which some of you feel yourselves sufficiently familiar.

In the first place, I should like to point out how great is the alteration in the general outlook on the subject of photometry compared with what it was a few years since. Only a few years ago, the whole question of light measurement was regarded as an interesting scientific study; but the vital practical bearing of the matter was hardly generally realized. There were, indeed, a few pioneering workers in the subject the benefit of whose efforts we reap to-day; but such researches as were carried out in this country were almost invariably purely scientific in their scope and aims.

This indifference may be partly explained by the fact that our available illuminants were then few in number. We had the candle, the flat-flame gas-burner, the paraffin lamp, and the carbon filament incandescent electric lamp for internal illumination and the arc lamp for outdoor use. Afterwards the introduction of the incandescent mantle was very instrumental in drawing attention to the subject; but the amazing developments of the last few years have been indirectly responsible for the general awakening to the fact that proper illumination is a matter of the greatest public and practical value.

Possibly those of you who have not followed this matter closely will hardly realize the extraordinary progress—and, more, the extraordinary increases in our rate of progress—now taking place in our ideas. Mr. James Swinburne, in his Presidential Address to the Institution of Electrical Engineers in 1902, summed up the situation as follows: "Our chief work, until lately, has been producing light. Here the inefficiency and waste are prodigious; and though it is mostly unavoidable, there is still great room for improvement. We take great care over our stations, watching every penny from the coal shovel or mechanical stoker to the station meter. We quarrel over 1 per cent. in the generators. When we get to the mains, we care less; and once we get to the consumers' meters, we care nothing at all."

Since the date of Mr. Swinburne's address, we have seen a wonderful development in illuminants. We have witnessed great progress in flame arcs, the metallic filament glow lamps, the inverted gas-mantle, and the development of high-pressure gas-lighting, and petrol-air lighting, not to mention the mercury arc-lamp, the Moore vapour tube, and many other lamps which are somewhat less familiar to the general public. Naturally, this progress has had the effect of drawing attention to the necessity for studying the best methods of using light. No doubt very much remains to be done in this direction; but it may fairly be said that at the present time many companies are no longer indifferent to the actual illumination that the consumer has at his disposal, and are becoming increasingly alive to the advantage derived by showing him how to use the power supplied to the very best effect.

After all, what the consumer wants is illumination—*i.e.*, light usefully applied. Therefore, we must have means of ascertaining, firstly, whether a source of light is really giving the light it is supposed to do; and, secondly, whether, having obtained this light, we are distributing it to the best advantage. Let us therefore now pass to the main subject of my lecture, and consider exactly what is wanted in order to describe the "power of creating brightness"—the illuminating power of a light.

It will be evident, in the first place, that we cannot—at least, at the present time—readily expect to measure this quantity directly by the movement of a pointer or by any mechanical means, as in the case of electricity for instance. We must, in fact, necessarily form our conclusions as to what lights can do by comparing their capability to make a surface bright. With this object in view, we say that, if we place either of two lights at a given distance from a white screen, and if, under exactly the same conditions, they both cause this surface to appear equally bright, the two lights have the same illuminating power. Thus it comes about that our first essential piece of apparatus in light measurement is some device which will enable us to tell exactly when two lights cause such a surface to appear equally bright. Given two sources of unequal intensity, we can then adjust their distances from the screen so as to secure this condition, and calculate their relative effects by noting their relative distance. Or we can alter the angle at which the rays from one of the sources strike the surface. There are, of course, other methods of adjusting the illumination from two lights to equal brilliancy, according to some known relation; but into these I will not enter at present.

Our chief need, therefore, is some means of telling accurately when two portions of an illuminated surface, or two exactly similar surfaces, are equally illuminated. One of the very first devices for this purpose was that of Count Rumford, who erected a rod in front of the white surface, and judged the relative brightness of the two shadows. A modification of this device is used by the Gas Referees to-day; and the method has, indeed, certain signal advantages. Afterwards the plan suggested itself of placing the two sources of light on either side of a sheet of white paper and then comparing the appearance of the two sides. The judgment in this case was rendered more accurate by the use of a "grease-spot" on the paper; and this type of photometer, too, while very simple in construction, is really regarded as an excellent one at the present time. A modification of this instrument was effected in the Lummer-Brodhun photometer, by means of an ingenious optical device. There have, of course, been many other types of photometers perfected, some of them exceedingly sensitive. An interesting instrument of recent date is the form of "contrast" photometer due to Dr. Bechstein—an example of which, by the kindness of the makers, Messrs. Franz, Schmidt, and Haensch, I am able to show this evening.

To sum up, it may be said that we have to-day many very perfect instruments, which enable this proceeding of judging the brightness of two surfaces to be accomplished with as great an accuracy as is commercially desirable for lights of the same colour. A practised worker in photometry, for instance, would probably consider himself able to form a judgment of equality of brightness under these conditions to within ½ per cent.; while Dr. Clayton Sharp has recently estimated the accuracy of photometrical testing at about 2 per cent., which is certainly ample accuracy for practical purposes.

An additional question that has commanded the attention of those engaged in photometry of late years has been the introduction of sources of light—such as the incandescent mantle, the flame arc, and the mercury vapour lamp—which differ considerably in colour. Naturally, it is very much more difficult to tell when the two surfaces illuminated by such diversely coloured lights are equally bright. To meet this difficulty, a new form of photometer, in which the two surfaces are exposed to the eye in rapid succession has been devised. Most of you, in going home in the trams or tubes by night, have experienced the unpleasant flickering effect on the eye which arises through the light from brilliant sources streaming into the tram or train as you pass by, and then being replaced by darkness. Just in the same way a throbbing, flickering sensation is caused when the two surfaces in the photometer, exhibited to the eye in succession as described, are unequally illuminated. But when we reach a point at which the apparent brightness of the surfaces is the same, the effect ceases. [The lecturer threw upon the screen a few of the devices for this purpose constructed by Rood, Whitman, Kruss, Simmance and Abady, and others.] Though primarily intended to facilitate the comparison of lights of different colour, flicker instruments can, of course, also be utilized for lights of the same colour, and a high degree of accuracy may be reached by such a means. Before leaving this subject, I must mention the simple and ingenious form of flicker photometer due to Mr. Lancelot W. Wild, who merely rotates a disc, half of which is greased and half plain. Messrs. Sugg and Co., the makers, have sent an example of this type of instrument for exhibition.

You will see, therefore, that there are a number of excellent photometers available to-day. So far as the mere judgment of illuminated surfaces goes, we can carry out photometric operations with an accuracy well within practical requirements. At the same time, there is no reason why we should not reach still more excellent results in the future, and, indeed, ultimately render judgment of the equality of brightness of two surfaces as certain an operation as observing the position of a pointer on a scale.

Let us now turn to another most important matter in photometry. We cannot be content with merely comparing the brightness of two lamps which we happen to have by us. We want some

standard of reference to which all such lamps can be referred. We want to be able to express the illuminating power of any lamp in terms of such a standard. This need was early realized, and it was proposed that the light from a candle—"one-candle power"—should be adopted as this standard. It was, however, soon realized that different candles, even burning under apparently the same conditions, gave very different results; and an attempt was therefore made to exactly define the nature of the standard candle by stating the nature of the materials of which it was to be composed, the rate of burning away, and so forth. Even so, it was ultimately discovered that the standard candle could not be reproduced with sufficient exactitude. The whole question was considered of such importance that a Royal Commission was appointed, and reported very unfavourably on the value of the candle as a standard. One interesting point, which illustrates the indifference that had seemingly been previously displayed to the illuminating powers of sources of light was that, according to the statement of certain witnesses, while great attention was paid to the conditions affecting general durability and reliability of candles, no tests of their illuminating power appeared to have been carried out or even contemplated.

Since the date of this Commission, various suggestions have been made as to possible standards of light. To-day, we use the 10-candle power standard—a lamp burning volatile hydrocarbon, pentane—which you see before you on the table. While not fulfilling the functions of an ideal standard, this lamp is at any rate an enormous advance over the old candle, and has been of very great benefit in removing many of the old misunderstandings arising from the want of a proper standard of reference. Corresponding lamps have been developed in France, Germany, and the United States.

While speaking on this point, I must mention the incalculable benefit to the subject of light measurement which has followed the efforts towards co-operation on the part of different countries. Appointed laboratories in this and the other countries mentioned are in constant communication. Standardized glow-lamps are now exchanged and tested by the various laboratories, in order that the standard of light in each country may be retained constant; and the ratios between the units adopted by different countries are now accurately known. It is now impossible for any serious misunderstanding as to the value of these standards to occur. One by one the small discrepancies still existing are being removed. One result, much to be desired, which we hope to see achieved very shortly is the establishment of an international unit of candle-power.

I may next mention one point which, though seemingly evident, has been the subject of considerable misunderstanding in the past. Naturally the light from any source of light differs very greatly in different directions. A glow lamp, for instance, gives its highest candle power in a direction at right angles to the filament, and its lowest in the direction of the cap of the bulb. An inverted mantle similarly gives its highest value immediately beneath the lamp, and its lowest in an upward direction, where the burner obstructs the light. Strictly, therefore, in order to compare different sources, we ought to take into account all the light from a source in all directions. We may accomplish this somewhat laboriously by studying the distribution-curve of light from the source. A distribution-curve of this nature is naturally of considerable use in other respects. But the process referred to is greatly simplified by the arrangements which have recently been introduced in order to concentrate the net effect of all the light on the photometer.

The Matthews "Integrating Photometer" and the Ulbricht "Globe Photometer" are examples of such devices. The important point to which I wish to draw attention, however, is that the possibility of uncertainty in this respect is now generally realized, and guarded against in photometry. At one time, this was not the case. It was certainly not realized by the engineer who suspended an arc lamp at four cross-roads, and stated that it gave 2000-candle power. When asked to justify this, he explained that the lamp gave 500-candle-power in each direction —*i.e.*, 2000 candles in all. This point again is one which has been brought into prominence by the recent introduction of sources of light yielding very different curves of distribution of light. It is only recently that the variety of illuminants has enforced the study of such curves on all who desire to deal with problems of illumination.

Hitherto I have referred to the measurement of the light from the source employed. Naturally it is important that all such sources should be tested, for we want in the first place a guarantee that the lamp is capable of producing certain results. But, even if our sources of light are all that are desired, we may fail to illuminate our premises because we fail to use our lights correctly. If, for instance, we place our lamps in such a position as not to throw light where it is wanted, or if we lose all their light by surrounding them with absurdly dense shades, our illumination must suffer. Again, the light needed for any building depends very much on the general scheme of decoration—on the colour of the wall-papers, for instance.

All this suggests the desirability of having some method of testing the actual illumination at the place where it is needed; and a type of portable photometer has been developed of recent years specially to meet this necessity. In such instruments the comparison source of light is placed with the photometer, in one piece of apparatus. This source may take the form of a small oil-lamp; and small electric lamps are found very convenient. Their use has been considerably simplified by the introduction of the Osram and other metallic filaments.

Such an instrument can be carried about to any desired locality. It may be used to test the illumination in the street or at a table in a building. It enables us to decide at once whether or not the illumination under any specified circumstances is below the allowable limit. The construction of the "Illuminometer," as this type of photometer is called, has been taken up with great energy during recent years; and there already exist quite a number of thoroughly practical instruments of this nature. Nevertheless, there is every reason to suppose that much progress will be made in their manufacture in the near future, and that such defects as yet exist will be removed very shortly.

I wish again to emphasize the statements made at the commencement of this lecture, as to the feasibility of measuring both the illuminating power of a source and the actual illumination under practical conditions. We have now a number of serviceable instruments for this purpose; and, as I remarked previously, we may reasonably expect that a few years will see considerable improvement in the results as yet achieved, and especially in the direction of greater simplicity. Illuminometers are really so simple in operation that, even in the hands of a novice, they may furnish an indication of whether the illumination enjoyed by a consumer is adequate or otherwise. I think, however, it must be recognized that, in order to determine exact values, and to suggest a remedy for the defective conditions thus brought to light, the services of an expert in illumination are required. Therefore when, as Mr. Gaster suggests, illumination in streets and public buildings is subjected to careful specification, and constantly tested by actual measurement, we may expect that such measurements will be undertaken by an expert in illumination, who will be a municipal inspector and discharge duties every whit as essential as those undertaken by sanitary and other municipal engineers of the present time. I look forward to the time when illumination will be specified and measured in the same exact and precise manner that is now considered essential in the case of any other commodity—such as light, food, or air—in which the general public is vitally interested, and it will be considered as reprehensible for the illumination of a street or public building to be manifestly deficient and below the value legally enacted, as for a tradesman to sell short weight or adulterated food.

Lastly, I wish to emphasize the importance of co-operation on the part of those in the same country, but representing different systems and aspects of illumination, and on the part of different nationalities. The time has now come when it must be realized that there are many questions which affect the general public very closely which cannot be adequately settled by individual effort, while questions of purely scientific interest often suffer through lack of suitable co-operation of workers in the same field, and consequent ignorance of what is being done in other quarters.

In particular, I should like to draw attention to Mr. Gaster's proposal, now two years old, that a permanent home of experiment in matters of illumination, including a museum where the ever-increasing collection of recent instruments for photometry and the measurement of illumination could be gathered together and rendered accessible to those generally interested. It is a truism in these days to remark upon the growing internationalism of science; but the work of the International Photometrical Commission, and the concerted effort between the laboratories of the nations interested, is an excellent example of what is possible by this means. In reality all the nations have contributed their share in assisting the progress of the movement towards better illumination. The United States, in establishing an Illuminating Engineering Society, have proved their appreciation of the need for mutual assistance in this matter. We ourselves certainly have also every reason to be proud of the work of the many pioneers in the subject in this country—such as Sir William Preece, Mr. Vernon Harcourt, Mr. Trotter, Mr. Dibdin, and Sir William Abney, to mention only a few of the names that occur in this connection. To these early efforts the apparently sudden growth of interest in the subject of illumination is largely due.

The CHAIRMAN said he thought those present would agree with him that Mr. Dow had tried to give, and succeeded in the short time at his disposal, a comprehensive history of the measurement of light and illumination. Regarding a kindred subject, he was glad to see the Local Government Board had determined to take up the question of the hygienic values of different illuminants. He thought the subject ought to be taken up by a Commission, as any individual who investigated a matter of this kind would find he had a very heavy task before him. Anyway, the inquiry would help them to come to a closer understanding as to the bearings of this hygienic question. The Board of Trade had also nominated a Committee to prepare everything possible for the International Electro-Technical Congress, at which would be discussed the question of standard units of light. There was no use at all condemning any method of lighting that was brought forward by mere ocular demonstrations as was too often done now, and saying that it was not so good as it ought to be, when they had instruments which were much more reliable and would be improved with use in the near future. He maintained that the new means now available would solve, by degrees, many difficulties. He proposed a vote of thanks to the lecturer.

Mr. HAYDN HARRISON seconded the motion; and there was hearty agreement.

GAS BURNING UNDER WATER.

At the Earl's Court Gas Exhibition of 1904, there was shown at the stand of the Smethurst Furnace Syndicate an arrangement that attracted much notice—giving a flame continuously burning under water. A somewhat similar proposal formed the subject-matter of a patent that recently passed the English office. The inventor was M. Emile Bohon, of Paris. He claimed as his invention the arrangement and use of apparatus "in which gases are mixed together and supplied to a burner, the quantities of the gases being so proportioned that complete combustion ensues, and no oxygen is required to be taken from the surrounding air; so that the flame is capable of continuous burning either in a vacuum or in a fluid of any kind."

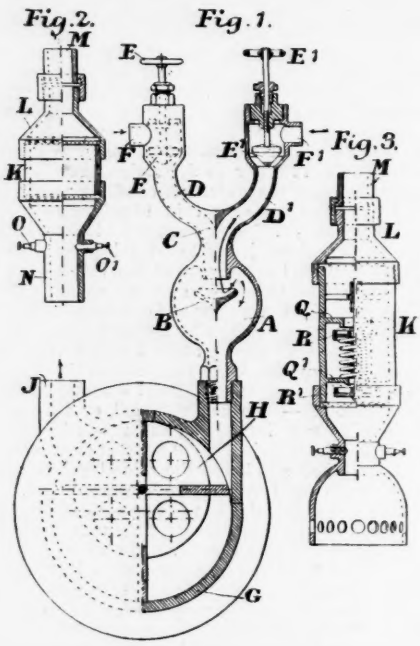


Fig. 1 shows, partly in section and partly in elevation, a device for the mixing of air and gas, as well as an exhauster-compressor. Fig. 2 shows, similarly, a form of burner for use in the open air. Fig. 3 is one form of the submerged burner.

The device for mixing the gases thoroughly before admitting them into the compressor comprises a connecting fork (screwed to the suction pipe of the compressor) which opens at the bottom into a spherical vessel A, provided inside with a concave metal part B arranged immediately below the inlet branch C. Owing to the sudden stoppage of the gaseous currents, says the patentee, these are thoroughly broken up—thus ensuring perfect mixture of the air and gas.

The two branches D D¹ of the fork surmounting the sphere A have exactly the same diameter, and are each provided with a conical valve E E¹ with a micrometric screw, enabling the gases to pass in exactly determined proportions. The valves are provided laterally with branches F F¹, intended to be connected—one to a reservoir of combustible gas, and the other to a suction funnel, provided with very fine metal netting to filter the entering air. At each junction is arranged a metal netting with very fine meshes (not shown), the object of which is to prevent the spread of the frame in case the mixture should get ignited. At the outlet of the compressor is arranged a safety valve, to prevent the return of the mixture during the first period of suction.

The compressor comprises a frame with metallic cylindrical casing G, in which is arranged an eccentric cylindrical roller H, furnished with four radial movable plates in contact with the inner periphery of the casing. Devices are provided to ensure the rotation of the roller, and a tight joint at the end of the blades with the cylindrical wall; so that "absolutely closed chambers containing the gaseous mixture are formed between each two consecutive blades."

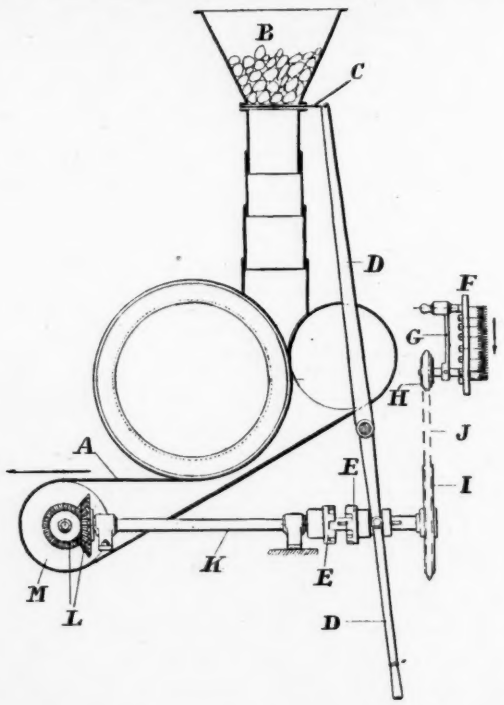
Owing to the eccentricity of the roller, the volume of gases drawn in between two blades gradually decreases until it is forced out at J—an arrangement that produces uniform compression, and, consequently, gives a constant discharge pressure. At each side of the casing are arranged chambers in which circulation of water brings about a cooling of the gases during compression. By means of this arrangement, the necessary discharge pressure (about 1·5 kg. per square centimetre) can be obtained.

The burner for the open air (fig. 2) consists of a cylinder K ending in two conical parts; the upper cone L being provided with a screw-threaded socket for connecting the inlet pipe M, and the bottom cone being arranged so as to receive the mouth N or burner proper, which is provided with electric ignition devices O O¹ set into sockets cast on the burner. At the joint of each of the cones with the cylinder are safety metal nettings to prevent lighting-back. The ignition contact devices consist of a porcelain mass through which passes a platinum wire, terminating (towards the interior of the burner) in a small ball of the same metal. This wire is connected to a terminal. For very high temperatures, the burner is provided with rings of refractory material, or is made of steatite or other refractory material.

The submerged burners (fig. 3) are based on the same principle as the other ones, but are provided, in addition, with a special closing device, which prevents water from choking up the inlet conduit M, in case of stoppage or at the moment of starting the apparatus. This device comprises two discs Q Q¹, cast in one with the cylindrical portion of the burner, and each provided with a small flange limiting the central perforation of the disc. Two discs R R¹, fixed on a rod sliding in a guide, ensure automatic closing by means of a helical spring regulated by a ring arranged for the purpose. Tight closing is ensured, according to the material of which the burner is made, either by placing side by side two conical parts engaging with each other, or by means of a leather or rubber packing. The bottom part of the burner is formed as a bell, so that the end of the burner-mouth is protected during the working of the apparatus.

CHARGING GAS-RETORTS BY INJECTION.

There has recently been published the specification of a patent taken out in France by the Société Sautter, Harlé, et Cie., for a retort-charger on the "injection" principle. It will be seen, from the accompanying illustration, that it consists of an injector formed of a belt, or any flexible appliance answering the same purpose,



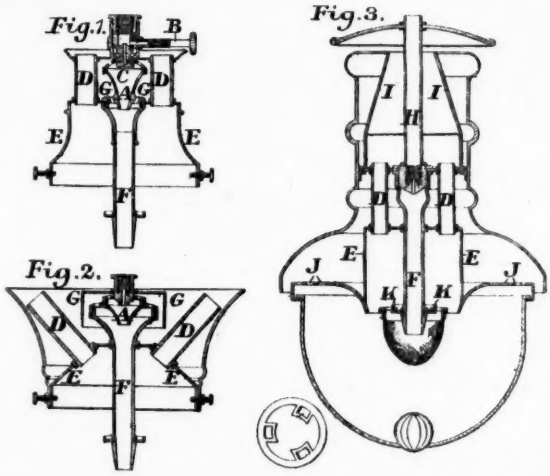
and a speed-controller, by which the charge of coal in the retort is regulated. The regulator may be either mechanical or electrical, provided it is closely connected with both the injector and the coal-distributor, so that it comes into operation as soon as the coal begins to reach the injector. The electric regulator consists of a commutator in communication with resistance coils placed in the circuit of the inductor of the motor which drives the injector, and works automatically, from the commencement to the end of the charge, by mechanism, either singly or in combination, such as toothed gear, racks, endless screws, chains, belts, &c., connected either with the working of the injector or with that of the distributor, when there is one.

In the accompanying illustration, which represents a side elevation, partly in section, of a charger having an electric regulator, A is the belt, B the hopper containing the coal, C the trap-door (opened only at the precise moment when the charging is commenced), and D the lever by which the door is opened. This lever governs, either directly or by transmission gearing, a coupling E, which makes it possible, when the door is opened, to connect the regulator with the belt. The regulator shown consists of a rheostat F, the handle G of which is driven by the shaft K and the mitre wheels L on one of the guide-pulleys M of the belt, through the agency of the coupling E and any suitable transmission gear, such as the pinions H I and the chain J. As soon as the coupling is engaged, the handle of the commutator is moved in the direction of the arrow, and the effect of the variations of the resistance coils on the motor circuit is to decrease the speed of the belt automatically till the end of the charge. At this

moment, all that is necessary is to move the lever D to disconnect the rheostat from the movement of the belt, and close the door of the hopper. It is found advantageous to effect this operation automatically, by placing at the end of the course of the handle of the rheostat a cam or any other device acting upon the disengaging lever. When the apparatus is furnished with an automatic distributor—for example, an archimedean screw placed at the lower part of the hopper—it may be of advantage to actuate the rheostat mechanically by means of the distributor.

NEW FRENCH INVERTED BURNER.

The last number of the "Journal de l'Eclairage au Gaz" contains the specification of an inverted burner, suitable for use with incandescent gas or illuminating hydrocarbons, recently patented in France by M. Hubert. The patentee states that ordinary inverted burners are usually defective in two respects—viz., in the supply of the illuminant to the burner, and in the discharge of the products of combustion. Moreover, he says little attention has up to now been paid to the utilization and regeneration of the heat. M. Hubert has endeavoured, in his burner, to remedy these defects, and make it possible, with an ordinary bunsen, to produce incandescence with gas or a suitable gaseous mixture, or even with light-giving hydrocarbons. In the accompanying illustrations, fig. 1 is a vertical section of a burner constructed as proposed by the inventor; fig. 2 shows a different arrangement of the heat-regenerator; and fig. 3 is a vertical section of a lamp designed for outdoor use.



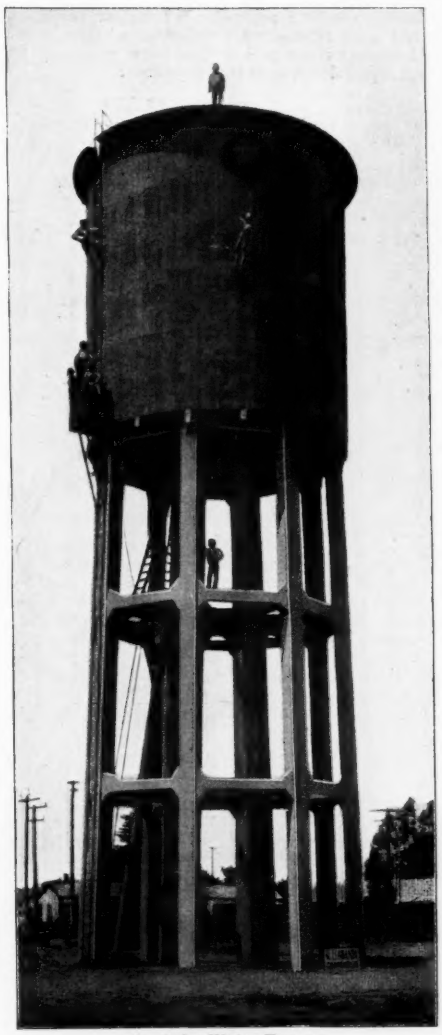
Above the burner A (fig. 1) there is fixed an ejector, to which is connected a screw B, whereby the quantity of gas passing into the annular space of the ejector, and thence into the orifice C of the burner, is regulated. By these means it is possible to adjust to a nicety the quantity of gas necessary for producing a perfect mixture, and also to obtain a very vertical and homogeneous jet. Regeneration of heat is effected by means of the tubes D, which may be either vertical, as shown in fig. 1, or inclined, as in fig. 2, and be made of plain or ribbed metal. The effect of a recuperator thus constructed is to concentrate in E the products of combustion on the central tube F; thus heating by regeneration the gaseous mixture coming from the burner. Moreover, the air entering the tube F through the orifices G is pre-heated by contact with the tubes D, and the regenerator then sets up a forced draught, which aspirates the gaseous mixture and thus facilitates its flow.

In fig. 3, the bunsen burner (which is an ordinary one without an ejector) is supplied with gas from an upper tube H. The body of the regenerator E is arranged round the central tube F, and connected by the tubes D with the chimney I, which sets up the draught. To the body of the regenerator is attached the reflector and globe-holder, pierced with holes J, and supporting the globe. Air enters through these openings, and is then aspirated, with the products of combustion, by the recuperator, and eventually escapes by the tubes D and the chimney. If required, the holes J can be dispensed with, and air be admitted into the globe through an opening in the bottom, closed, but not entirely, by a ribbed ball. The mantle may be suspended in any suitable way from the lower part of the tube F. In fig. 3, there is a special device (shown on a larger scale at the side of the figure) by which the crown of the mantle is furnished with a certain number of tongues having openings, which are fixed on hooks or projections K formed on the collar supporting the mantle. This arrangement allows of the free passage of the combustion gases, and prevents lateral displacement of the mantle.

For the position as Superintendent at the Lum Street Gas-Works of the Bolton Corporation there were 65 applications. Six of these are to be selected by a Sub-Committee to appear before the General Committee on Friday.

A REINFORCED CONCRETE WATER-TOWER.

In the "JOURNAL" for the 10th of September last (p. 702), we reproduced from "Engineering Record" some particulars in regard to a reinforced concrete water-tower, with a tank having a capacity of 200,000 gallons, which was then in progress in connection with the reconstructed water-works system at Anaheim (Cal.). At the time the contract was awarded, proposals were received for a steel tank on a steel tower, and for a tank and tower of reinforced concrete. The prices submitted for the former ranged from $9200 to $12,500; while two bids for concrete towers were—one for $10,400 and the other for a much higher sum. The lower bid for the concrete structure was accepted; and the tower has been completed for the amount stated.



Anaheim Water Tower.

The tower has a total height of 102 feet; the bottom of the tank, which is 30 feet in diameter and 32 feet high, being 60 feet above the ground. The walls of the tank vary uniformly from 4 inches thick at the top to 6 inches at the bottom. They are made of concrete, in the proportions of 1 part of portland cement, 2 parts of river sand, and 2 parts of broken stone—crusher run of stone, with ½-inch pieces as the maximum used. The forms for the walls were continuous from the bottom to the top, and were built thoroughly tight. The lagging of the forms consisted of 1 in. by 3 in. tongue-and-grooved pine flooring in 30-feet lengths, which were placed vertically and well braced in position. The concrete was made quite wet, and was poured into the forms as nearly continuously as possible, to overcome any tendency to lines of cleavage in it. The forms were allowed to remain on the walls of the tank until the last concrete in them had been placed for about two weeks. After they were removed, a 1 to 1 sand and mortar coat, ½-inch thick, was applied to the interior surface, and then painted with a neat cement wash. As the walls thus waterproofed were not entirely tight, and the contractor particularly desired to produce a perfectly tight tank, the mortar coat was removed, and a plaster coat of neat cement ¼-inch thick, was painted over the interior surface of the wall. The walls were rendered practically impervious in this manner, as the tank showed no leaks when it was filled after the coat of neat cement had been applied directly to the concrete. In several spots, however, enough

moisture penetrated through the concrete to produce dampness on the outside. Since then these spots have gradually been reduced in area until they have almost entirely disappeared. The water stored in the tank also carries a considerable quantity of alkali salts, which are expected to fill the pores of the concrete sufficiently to cause this slight appearance of dampness on the outside of the walls to be completely overcome.

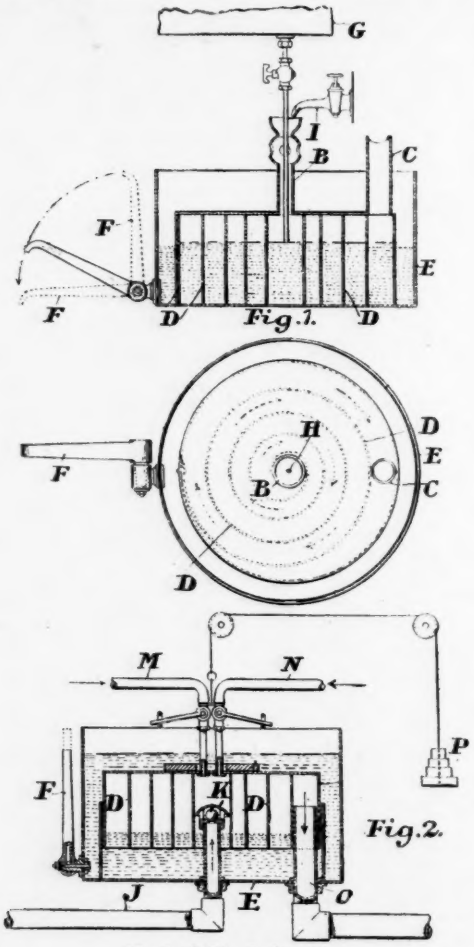
REGISTER OF PATENTS.

Carburetting Contrivances.

DE LAITTE, L. B., of Middlesex Street, E.

No. 7925; April 4, 1907.

This invention relates to apparatus for effecting the vaporization of hydrocarbon liquids in a prolonged horizontal passage, the upper boundary and sides of which are composed of metal plates, whereas the lower boundary is a liquid surface (such as water), on which the hydrocarbon liquid floats, until it is vaporized.



The De Laitte Carburettor.

Fig. 1 is a sectional elevation and plan of an arrangement in which the fluid is drawn through the carburettor under suction. Fig. 2 shows the construction when the fluid is forced through under pressure.

In fig. 1, a cylindrical vessel is shown open at the bottom and closed at the top with the exception of an orifice at the centre, to which a vertical pipe B is secured, through which is admitted air, hydrocarbon liquid, and water; and an aperture fitted with a pipe C through which is conveyed the carburetted air. It is also fitted with a spirally-bent thin plate D secured to it along its upper spiral edge and along its vertical edge—the lower edge of the spiral plate being flush with the lower edge of the vessel. The vessel itself is immersed in water contained in a flat-bottomed cylindrical vessel E, fitted with an overflow pipe F pivotally attached, so that the height of the water can be adjusted. Hydrocarbon liquid from a tank G flows into the central vertical pipe and descends to the surface of the water in the interior end of the passage formed by the spiral plate D. Into the funnel-shaped upper end of the pipe B water can be admitted at I, and through orifices formed in the upper end of the pipe air flows from the atmosphere—inspired by the suction created by the withdrawal of the carburetted air through the pipe C. The supply of hydrocarbon is arranged to take place in small doses, the number of which is arranged to be proportional to the volume of air inspired.

In fig. 2, the inverted vessel is, as before, charged with air under pressure by a pipe J leading from some air-forcing machine up through the centre of the bottom of the vessel E. The upper end of the pipe, being well above the water level in E, is commanded by a non-return valve and covered by a plate K fixed sufficiently above the pipe to permit free passage of air into the central part of the spiral passage beneath the cover-plate. The hydrocarbon is led through a flexible pipe M and also a hand-adjusted valve to near the centre of the crown of the vessel, and, falling on the plate K, drips off its edges around the outside of the air admission pipe J. Similarly, water is supplied by another flexible pipe N. The carburetted air thus produced escapes through the pipe O, which leads from the space at the outward end of the spiral passage and passes downwards, through the bottom of the vessel E, to the place of consumption.

In this last described construction, the inner vessel floats on the atmosphere of carburetted air contained within it, and can rise and enlarge the spiral passage when the volume of air forced through the pipe J increases or falls, and diminishes the height of the spiral passage when the supply of air lessens. On rising, it may be arranged that automatically adjusting cocks should open wider and permit an increased supply of hydrocarbon and water to correspond to the larger volume of air delivered, and *vice versâ* when the vessel sinks deeper than the normal.

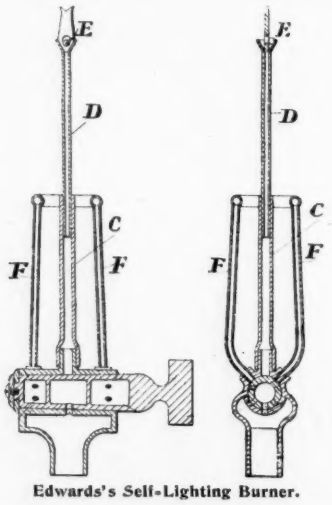
Further adjustments are available, such as loading the vessel more or less by removing less or more of the counterbalance weight P, and by constricting more or less, by a valve, the escape passage through the pipe O.

Self-Lighting Incandescent Gas-Burners.

EDWARDS, W. C., of Vauxhall Bridge Road, S.W.

No. 8371; April 10, 1907.

This self-lighting incandescent burner is of the class wherein a tubular mantle fork or rod is employed as a pilot-jet—being ignited by some catalytic agent when the gas is turned on.



Edwards's Self-Lighting Burner.

The fitting (as shown) is provided with a rotatable barrel or hollow plug divided into three separate chambers and capable of being turned within the fitting by means of the tap finger-piece. Proceeding from the top of the fitting is an outlet passage upon which is a tube C arranged to carry a hollow fork or mantle suspension rod D, provided with a bed or receptacle for supporting a catalytic pellet E of spongy platinum or the like, and above is the forked extremity upon which the mantle hangs in the usual manner. Proceeding from the fitting outlet are ducts F, which carry a mixture of air and gas to the burner-ring when the gas is turned on—suitable inlets being provided for the purpose of admitting the air.

When the gas is turned off (the position shown), gas is admitted to the central chamber of the rotatable barrel through the coinciding ports, and it becomes filled with gas. If the tap is now turned on, the barrel is in such a position that a limited supply of gas passes up the tube C and tubular fork D to the pellet E, which becomes incandescent and ignites the gas by that time supplied to the burner through the pipes or ducts F. By this means, the inventor points out, the catalytic pellet is not only readily renewable, but is only subjected to the action of the gas for short periods at the time, and retains its properties.

Production of Gas for Heating and Illuminating Purposes.

TULLY, C. B., of Wood Green, N.

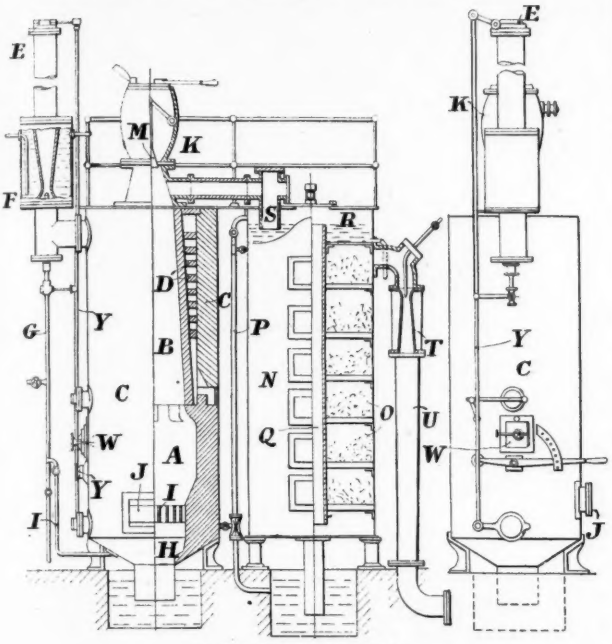
No. 10,346; May 3, 1907.

This invention relates to the manufacture of coal gas, water gas, producer gas, or methane hydrogen gas, or a mixture of them at will; and it has for its object to enable this to be effected in plant of simple construction and "more especially intended for use where the demand for gas is not heavy, and it is desired to dispense with mechanically operated air compressors or blowers."

The generator or gas producer employed comprises a lower fuel-chamber A provided at its upper end with a vertical retort B surrounded by a jacket C, preferably containing chequer brickwork D, and adapted to receive and permit gas derived from the passage of air through a bed of incandescent fuel in the lower part of the generator to be consumed in presence of the air to heat the retort or retorts. But, in lieu of employing a compressor to force the air through the incandescent fuel bed and the products of combustion from the jacket through the customary snift-valve E, there is interposed between the valve and the jacket a steam-jet ejector or exhausting device F, with means for controlling

the steam supply pipe G. The arrangement is such that during the preliminary or blowing-up stage of the process of gas manufacture, the snift-valve is free to open, or is positively opened, as required, and the jet-ejector is in operation. The generator is provided at the lower end with a water-sealed ash grate or hearth H, and above the grate-bars with a clinkering door J, through which any excess of coke, as well as clinker, produced can be withdrawn. Fuel is fed to the upper end of the retort through a charging hopper K and bell M.

When coal gas is to be produced alone, or in admixture with producer gas, water gas, or water gas and methane-hydrogen gas, the retort is charged with coal capable of yielding a good hard coke.



Tully's Modified Gas-Producer.

With the generator described there is employed a combined gas scrubber and condenser, through which the gas is passed on its way from the gas generator and retort or retorts to the gasholder. This comprises a chamber N, divided into compartments O, filled with coke or other scrubbing material, plentifully supplied with water through P for washing out the impurities and condensing the gas. A central vertical pipe Q receives the gas from an upper compartment R in communication with the upper part of the retort through a water-seal dip-pipe S, by another steam-jet ejector or exhausting device T, preferably at the upper end of the vertical pipe Q, or, as shown, in a pipe U leading from the uppermost of the scrubber compartments O to the gasholder. Water is supplied from the pipe P to the compartment R for sealing the dip-pipe S. The gas in its passage through the combined scrubber and condenser flows in an upward direction through the scrubbing material in the compartments O.

The plant thus far described is suitable for generating producer gas, which may be either wholly consumed in the jacket C for heating the retort B, in the production of coal gas, as contemplated above, or it may be in part consumed in the jacket and in part drawn through the retort by suitably adjusting the action of the steam-jet exhausters F and T; the latter part, in admixture with the coal gas produced, passing through the combined scrubber and condenser N to the gasholder by the pipe connection U. When, however, it is desired to generate water gas, a steam-supply pipe V discharges steam under the grate-bars of the generator in the ordinary way; the resulting gas being drawn off at the top, blended with the coal gas produced in the retort. In like manner, water gas and methane hydrogen gas can be produced, blended with coal gas, by introducing tar or other hydrocarbon into the portion A of the generator in the region of the incandescent fuel bed, while steam is being also supplied—such introduction being effected by a nozzle at W.

When it is desired to produce and collect producer gas alone, or water gas alone, or water gas and methane-hydrogen gas, the generator and retort B are charged with coke, instead of with fuel such as coal from which gas will be evolved by distillation.

When the consumption of gas is small or stopped, the apparatus can be maintained in working condition by opening the air and stack valves enough to allow air to flow through the fuel in the producer and generate sufficient heat by the combustion of the resulting gas in the jacket of the retort to maintain it at the desired temperature; the coal gas produced at this time being drawn off and stored. At this time the steam-valve remains closed; the connection between the valve and operating rod Y being such as to allow of the air and stack valves being opened to a small extent without opening the steam-valve.

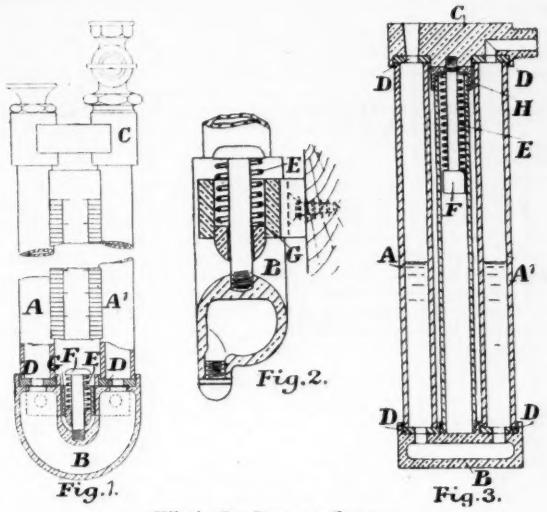
Pressure-Gauges.

MILNE, J., of Edinburgh.

No. 10,297; May 3, 1907.

The patentee claims the use, in U-tube gas pressure-gauges for low pressures, of a spring to keep the metal sockets pressed against the washers of rubber or other material, and to force them against the ends of the glass tubes, so as to form a gas and water tight joint.

Fig. 1 shows a front view partly in section, and fig. 2 a sectional side view of one adaptation of the spring to make such a joint in a pressure-gauge. Fig. 3 shows a sectional front view of an alternative arrangement. The former is for attachment to a fixed backing, while the latter is self-contained.



Milne's Gas Pressure-Gauge.

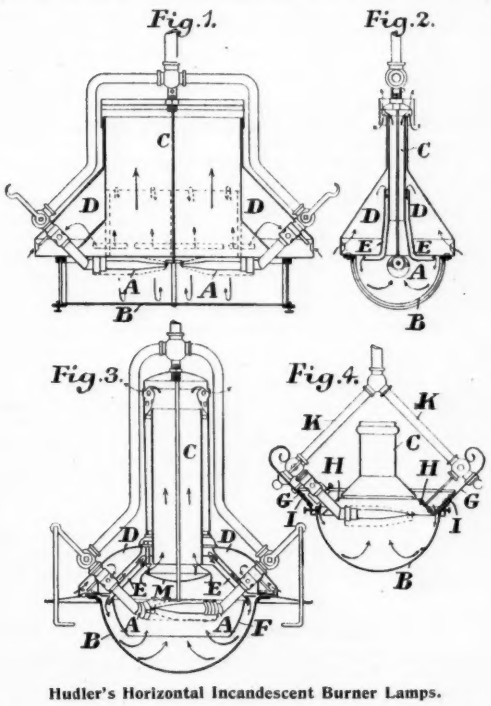
A and A¹ are the glass tubes; B and C, the metal sockets; D, the washers, of rubber or other material; E, the spring held by pressing at one end against the stop F, and at the other end by pressing against the slide G, which is fixed to the backing in figs. 1 and 2, and by pressing against the screwed cap H at the end of central tube in fig. 3. The spring E thus tends to force the stop F and metal socket B towards the socket C; and the glass tubes A and A¹ being between the two sockets B and C, the washers D are pressed close against the ends of the tubes A and A¹—thus making a gas and water tight joint.

Incandescent Lamps having Horizontal Burners.

HUDLER, J., of Niederschoneweide, near Berlin.

No. 11,768; May 21, 1907.

This invention relates to incandescent gas-lamps having horizontal burners and made in accordance with patent No. 1696 of 1904. The object aimed at is "to permit of the use of as small a glass globe or cover as possible through which the mixing-tube does not pass, and at the same time to attain the greatest possible brilliancy and keep the light as free from shadow as possible." Burners with mixing-tubes bent downwards are used; and these tubes form an angle with the axis of the horizontal burner—preferably an obtuse angle, "so that it is possible to use a considerably smaller glass as well as to give the lamp



Hudler's Horizontal Incandescent Burner Lamps.

a much better appearance than can be obtained with burners in which the axis of the mixing-tube coincides with the axis of the burner." The adoption of angled burner connections offers, it is said, another and very important advantage. The space formed by the glass globe and by its cover (which leaves free the opening for air, and is fitted with an outlet funnel) contains only the burner itself properly so called, while the mixing-tube is outside this space, and is subject to the atmospheric

pressure. With this arrangement, "owing to the rarefaction of the air due to the combustion," there is said to be an increased in-draught into the air or blast pipe, which would not be the case if the pipe were placed in the same chamber as the burner.

Figs. 1 and 2 show, in longitudinal and cross section, a street-lamp of rectangular shape. The lamp has two burners A in line; and these are enclosed below in a half-cylinder of glass B, placed horizontally. In the flat cover of this glass there is made a long opening or slot over the two burners and leading to the chimney C, of extended rectangular section. At its lower part the chimney is surrounded by a space D, into which the outer air first makes its way, and in which also lies the opening of the mixing-tube for the burners. From this space the air enters two preliminary heating channels E, which conduct it against the inner surface of the horizontal semicylinder B, and thus "cause it to come into suitable contact with the incandescent body."

The lamp illustrated in fig. 3 is of circular shape. The two burners A lie alongside one another, with their axes parallel; while the two axes of the mixing-tubes lie in a vertical plane passing through the middle line of the lamp. The glass cover consists of a half-globe B, inside of which a second half-globe or saucer F (open below) can be fitted, in order to secure that the air, which has previously been heated, will be supplied to the burner at the proper level. The baffle-plate M, which also serves as a reflector, forces the gases of combustion against the lateral air-passages so as to render more effective the preliminary heating of the air.

Fig. 4 shows a lamp for interior lighting. The glass cover in this case is in the form of a half-globe, and is held securely on a ring I, which carries a second funnel-shaped ring H on angular rings, and is firmly connected with the gas-tube K by two carrying links G. On the ring is fixed a glass cylinder C, expanded outwards at its lower part, "in order to give light at the top and produce an upward draught."

The lamp can also be made with two burners, in which case the arrangement of the burners would be similar to that shown in fig. 3. The lamps illustrated in figs. 1 and 3 can also be used with single burners, and then an igniting flame or pilot light (which is placed in the centre in the case of double burners) is fitted at one of the sides instead of the second gas-nozzle.

Treatment of Coal for Fuel and Gas Manufacture. "Coalexld."*

JOWETT, J., of Bolton-le-Sands, Lancs.

No. 14,893; June 29, 1907.

This invention relates to the manufacture of fuel from "practically any quality of coal worthy of that name"—the fuel being in the form of "what is generally known as coke." The object of the invention is thus described by the patentee: "To manufacture a special coke or fuel from coal, either in the ordinary process of gas manufacture—that is, by treating the coal with certain chemicals before the retorts are charged, or by treating coal before it is placed in coking-ovens, or by treating the coke resulting from gas manufacture or other coking process, when hot or cold, by the chemicals in such a manner as to produce a fuel in the nature of coke, which will burn freely, practically without smoke being given off, and with a minimum of deleterious fumes, and when burnt in an ordinary household grate, which will give off more radiant heat than household coal or ordinary coke, and which will rapidly become clear and bright." Further, "the fuel will be found to be of great utility when used in blacksmith's hearths, and for general engineering purposes—enabling clean welds to be made without the metal twisting during the process of cooling, as is now often found to be the case."

The actual manufacture of the fuel needs no special appliances or plant; the fuel being generally made in ordinary retorts—that is to say, the treatment may be carried on in any ordinary gas-works without any detriment to the output of gas.

The quantity of chemicals used will vary with the quality of the coal; but for an average quality of gas coal, the patentee finds that to every ton of coal, a solution with water of the following chemicals or the intimate mixing of the coal and chemicals alone, gives the desired result: Chlorate of potash, 14 oz.; saltpetre, 6 oz.; permanganate of potash, ¼ oz.—a total of about 20¼ oz. of chemicals to one ton of coal, or from 3 oz. to 4 oz. per retort charge of 3 cwt. A maximum total weight of 36 oz. of chemicals is said to be sufficient for the worst classes of coal; this weight being divided up as follows: 24 oz. of chlorate of potash, 12 oz. of saltpetre, and ¾ oz. of permanganate of potash per ton of coal treated.

The solution is sprayed over and into the coal, and the whole thoroughly mixed; and "the retorts are charged as in the ordinary manner of gas or coke manufacture." A good result is also said to be obtained by spraying coke, as usually made, when drawn from retorts or coking-ovens, with the chemicals, "although, for obvious reasons, the fuel resulting from this latter process is not so good as that from the first process." The fuel produced from the first process may, however, be sprayed with the solution with a further beneficial result.

With regard to the treatment of inferior coal, the inventor says he has "found, after repeated experiments, that the treatment of practically any coal worthy of the name by the chemicals enumerated will cause the same to coke readily, and that such coke will burn clear and bright."

* See "JOURNAL" for April 28, p. 211.

Operating Gas-Taps, &c.

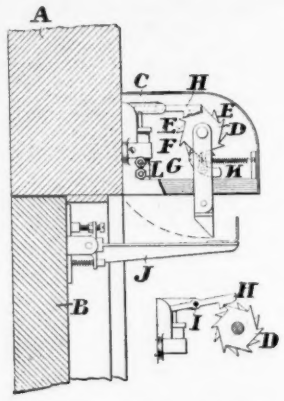
MASKELYNE, J. N., of St. George's Hall, Langham Place.

No. 15,522; July 5, 1907.

This invention has primarily for its object to provide means for automatically turning on and off lights in public lavatories, &c.

Fitted to the partition or wall A is a box C. Within which, on a transverse axle, is mounted a wheel D, with two sets of ratchet teeth E and F side by side. The teeth E are twice as numerous as the teeth F, and are engaged by a pawl G, carried by a lever pendent from the axis of the wheel D. Upon the teeth rests the extremity of a lever H, the opposite end of which operates the gas-tap.

If the wheel D is rotated, the lever H alternately assumes the positions illustrated—that is to say, it rests alternately between the teeth F and upon the points of the latter. This will give to the lever the two positions necessary to enable it to operate the tap off and on as



Maskelyne's Gas-Tap Operator.

requisite. The pendent lever is operated by a bracket J upon the door B; the bracket pulling the lever to the left each time the door is opened.

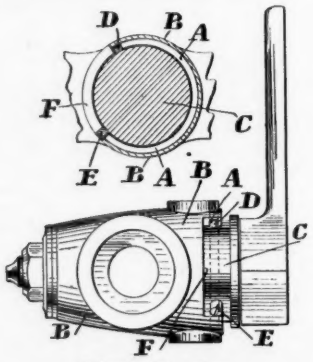
The lever is returned by the spring K, and in the shown position yields to the returning bracket by reason of the jointed portion when the door is closed.

Plug-Taps.

EDGAR, W., of Hammersmith, W.

No. 17,350; July 29, 1907.

This improvement consists in making a groove on the inside of the shell of the tap and applying to the plug a pin which is positioned in the groove of the shell so as to prevent the plug falling out of the shell or being removed without indicating same.



Edgar's Plug-Tap.

As shown, there is formed a groove A around the shell B on the inside; and on the plug C is fitted a pin D, which rides in the groove—the pin being of such thickness as to allow of easy movement along the groove, and so that, should the plug get fixed in the shell, it can be loosened so as to turn easily without interfering with the pin. When the tap has only a limited movement in the shell, owing to the pin E projecting from the plug being positioned and riding in a recess F of the shell, the groove is formed in line with the recess, and the limiting pin E on the plug is so placed that the locking pin D is within the groove during the whole movement of the plug. But when the plug does not have such a limited movement, an opening is cut into the recess A through which the locking pin D is passed in securing it to the plug, and this is afterwards sealed up to completely enclose the pin.

Production of Lighting Gas.

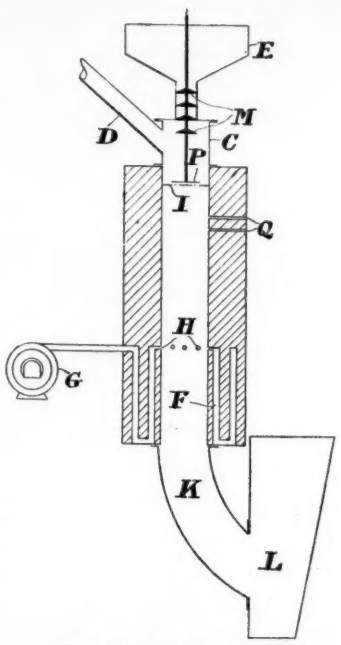
ERNST, E. U. G., of Copenhagen.

No. 17,991; Aug. 7, 1907. Date claimed under International Convention, Aug. 8, 1906.

The patentee prefaces his specification by saying: "Since the invention and practical introduction of the incandescent mantle in the year 1890, there has been less necessity in gas lighting to employ a gas which when burnt is directly illuminant than a gas which when burnt develops so high a temperature as to make the mantle glow. In consequence of this circumstance, various non-illuminating kinds of gas of less combustion value than coal gas but developing a temperature high enough to make the mantle glow—as, for instance, water gas and air gas—have during recent years been used to a certain extent. The water gas has, however, the defect that its production is non-continuous, and the use of air gas is hindered by the high cost of the raw material. The present invention avoids these defects, and has for object the continuous production of lighting gas and cokes from gas coal and the like."

The invention, which is said to be specially applicable for villages and small towns, consists in the use of vertical or sloping vessels made without a grate, and into which the coal is charged from above, and

the coke removed below through a water-lute, so that the fuel-column falls down in the vessel freely periodically or continuously. "Air is forced in in limited quantity, and the combustion is effected to an extent sufficient for decomposing the steam rising from the water-lute and producing just that amount of water gas mixed with generator gas as will serve to distil off coal gas from the overlying coal; so that a mixture of generator gas, water gas, and coal gas (the two former in minimum proportion) is carried off above and purified like ordinary coal gas."



Ernst's Vertical Retort-Chamber.

A retort for carrying out the process is shown "as an example in the drawing in vertical section; certain details being omitted."

The retort, surrounded by armoured brickwork, is at the top provided with a sheet-iron prolongation C with a gas outlet pipe D and feed-hopper E. At the lower part of the brickwork is a "pre-heater flue" F, connected with a blower G and a number of apertures H, through which the outer air enters the burning column in the retort—say, about 1 metre below the normal upper line I of the charge. The retort ends below in a curved or sloping flue K, which leads to a vessel L, serving as a water-lute, from which the slaked coke is removed.

The feed device consists of a number of conical discs M hung on a rod passed through the hopper. A plate on the lower end of the rod will, at a certain point (contingent on the depth of the charge in the retort), be stopped by the coal, and thus determine how many of the measuring spaces are to be emptied each time the rod is lifted—that is to say, each time to a constant height; while it may drop to varying depths. By this arrangement the charge is kept about constant.

When in operation, combustion and decomposition of the steam arising from below takes place in the lower part of the fuel-column situated between the openings H and the sight holes Q. The mixture of nitrogen, hydrogen, carbonic oxide, and carbonic acid passes up in the middle part of this fuel-column, and the carbonic acid is there reduced to carbonic oxide. In the upper part there will thus only be found nitrogen, hydrogen, and carbonic oxide. Further combustion is excluded; so that the temperature decreases upward. The zone of glow ends about at the level of the sight holes.

The final coking of the coal takes place at this level, or a little below it; the first coking begins higher up by the heat from the generator, water, and coal gas coming from below. In this way combustion is prevented; and "also every noxious heating of the coal gas, which therefore has the same qualities as the gas which in a gas-retort are developed in the beginning of a period of distillation."

Inverted Incandescent Gas-Burners.

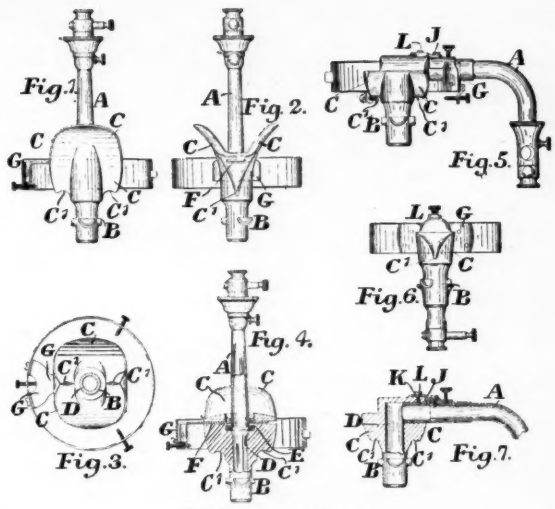
Bray, J. W., of Leeds.

No. 2285; Feb. 1, 1908.

This invention has for its object the construction of a burner whereby the products of combustion are prevented from coming in contact with the metal parts of the burner. The improvement may be applied equally well to the type of burner in which a bent or curved bunsen tube or gas and air supply pipe is used, as also to what is known as a "reversible inverted," described in patent No. 10,570 of 1905.

The deflector employed is adapted to perform the functions of a combined nozzle and deflector; and there are means for attaching the nozzle and deflector to the bunsen tube and globe carrier or gallery. In the form shown in fig. 1, the nozzle B (provided with means for supporting a mantle) preferably forms part of the porcelain deflector. The form of it comprises two wings C, inclining downwards towards one another till they meet on a line some little distance above the mantle. The wings are provided with curved faces, as figs. 1, 2, and 3; and the edges C^1 are also curved, as shown. The curved edges and curved wings have the effect of dividing up the products of combustion and directing them away above the gallery in such a manner that not only the parts above the deflector are protected, but also the metal work of the attachment G.

In order to attach the gallery and bunsen tube A to the deflector, in the upper portion of the orifice or passage D (fig. 4), through which passes the gas and air mixture, is placed a metal ring E, seated on an asbestos ring. An aperture F is made in the deflector between the wings C; and into it is placed a portion of a bracket G, provided with a threaded aperture. The bracket is placed in position with the aperture over the orifice D; and the bunsen tube is screwed home until its end rests against the ring or seating E. By using this deflector the products of combustion are prevented from reaching the only exposed metal portion of the burner in the example shown—namely, the bracket G.



Bray's Inverted Burners.

As applied to an inverted burner having a bent or curved bunsen tube A (as shown in fig. 5), the deflector is as previously described. But the orifice or passage D is preferably at an angle, and into it is placed one end of the bunsen tube; the bracket G, which carries the gallery embracing the bunsen tube or the like, having an end turned over towards the deflector. To it is attached one end of a bracket or arm J—the other end fitting into a recess formed in the deflector top; and a screw, plug, or the like L, is inserted into an aperture K in the arm J, and thence into an aperture in the deflector—see fig. 7. In this form of burner, although the tube A becomes heated it will be protected from material corrosion, owing to the deflector. The wings C in this case need not be of the length shown in figs. 1 and 2, or the wings shown need not be so prominent.

Where a horizontal bunsen tube is used, the method of attaching the deflector to the tube will be substantially as described with reference to fig. 7.

APPLICATIONS FOR LETTERS PATENT.

9150.—Evans, A. G., "Measuring and indicating the explosive and calorific values of gaseous mixtures." April 28.

9200.—Putman, W. E., and Rawden, J. W., "Scraping and cleaning water-mains." Partly communicated by J. Goodwin. April 28.

9225.—Rappaport, M., "Junction-boxes for water-pipes." April 28.

9226.—Goodall, A., "Quenching, screening, and loading coke." April 28.

9228.—Kirkham, Hulett, and Chandler, Ltd., and Perry, S., "Manufacture of gas." April 28.

9267.—Robinson, G. H., "Gas-stoves." April 29.

9276.—Graetz, M., "Inverted lamps." April 29.

9286.—Deutsche Gasglühlicht Aktiengesellschaft (Auergesellschaft), "Inverted burners." April 29.

9306.—Stubbers, J., "Mantles." April 29.

9325.—Key, W., "Carburetted air gas." April 30.

9362.—Chipperfield, W. H., "Suspending gas-lamps." April 30.

9384.—Kirkham, Hulett, and Chandler, Ltd., and Hersey, S., "Purification of gas." April 30.

9390.—Jackson, P. J., "Pipe-union." April 30.

9486.—Lemarinier, G., "Burners." May 1.

9570.—Cutler, S., "Spiral-guided gasholders." May 2.

9622.—Laigle, R., "Filaments for mantles." May 4.

9648.—Barbezat, A., "Steam and gas turbine." May 4.

9673.—West, J., "Discharging and charging retorts." May 4.

9686.—Nielsen, F. G., "Cooling ascension-pipes." May 4.

9760.—Schubert, O., "Lighting street lamps." May 5.

9771.—M'Carty, R. J., "Compressors or blowers." May 5.

9823.—Tee, H., and Adams, F. E., "Gas compressing or forcing apparatus." May 6.

9828.—Rotherham, K., "Adjustable gas-nipple." May 6.

9891.—Thiemich, B., "Gas-producers." May 6.

9892.—Zickwolff, E., "Pressure-controlled gas-igniters." May 6.

9907.—Tweedie, R. O., "Anti-vibrators." May 7.

9916.—Sutton, C. J., and Rudd, J., "Holder for inverted mantles." May 7.

9945.—Scott-Snell, C., and Stuart, C. H., "Incandescent gas lighting." May 7.

9960-1.—Smith, G. B. & E. W., "Prepayment gas-meters." May 7.

9965.—Glover, T., "Gas-heated furnace." May 7.

9996.—Thomson, W., "Gas-lighting appliance." May 8.

10,017.—Reeson, J. N., and Burton, A. E., "Opening and closing the controlling valve or cock of a gas-burner." May 8.

10,042.—Thomas, D. M., "Geysers and the like." May 8.

10,046.—Head, B. W., "Bringing charges into position to be taken up by apparatus for charging furnaces." May 8.

10,105.—Sperryn, G. N., "Gas-burners." May 9.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Toddington Gas Company.

SIR,—Of all your readers, no one sympathizes more with your observations on the above than the writer, who designed, erected, and owned them for the first fifteen years or so of their existence. The circulars asking for loan were sent to one of my daughters (not to me!); and the views printed with them show the identical retort-house, coal-store, lime-shed, gasholder, and workman's cottage that I started them with.

Then the plait trade was good; American oil was not so cheap; and a price of 6s. or so per 1000 cubic feet (sad to say) could be charged for gas and about £120 a year profit made—disregarding my own services. I sold the concern to Mr. A. F. Phillips for a Company; and I think I got £1200, which was rather less than they cost. This was near on forty years ago; and my memory may not be exact.

I have never seen the little town since; but my pride in the stability of the plant and building revealed by the photos is marred by the staggering facts you give as to the capital and loan now attached to them. Some one has blundered, or worse.

How can these things be stopped? I have spoken warnings at general meetings over and over again, since the Goudhurst exposure followed by the fiasco of the claims made at the Colnbrook arbitration. But one's warning never reaches the unwary investors of small means and less experience, who swallow the inducements held out by references to large prosperous gas undertakings having really nothing in common with the two or three million feet a year village gas-works which cannot live except at a price of gas that prohibits general consumption.

Well I fear it is no use; but the incident of this circular has stirred me with "its voice from the past," and impelled me to supplement your notes.

HY. E. JONES.

Palace Chambers, Westminster, May 16, 1908.

Sulphate Saturators.

SIR,—Replying once more to Mr. Pettigrew, I cannot recall, in the whole of my experience of the manufacture of sulphate of ammonia, a single instance in which the wall of the cracker-pipe was made sufficiently thick that the perforations did not become materially enlarged in cross sectional area; and, without hesitation, I affirm that the perforations do become enlarged.

However, in order to convince Mr. Pettigrew as to the truth of this assertion, it is only necessary to refer him to the "Forty-Second Annual Report on Alkali Works," p. 60. Mr. Young, one of the Inspectors, in making some observations on the formation of "blue salt," mentions that in one case "the still is of good English pattern and the saturator of Taylor's best heavy lead pattern," and, in order to discover the cause of the production of the "blue salt," the saturator was examined. Mr. Young continues: "On investigation, it was found that the holes in the ammonia pipes behind the apron of the saturator were much enlarged"—a sufficiently impartial statement, and proving beyond possibility of doubt that the wall of the cracker-pipe is not, in practice, made as thick as Mr. Pettigrew would have us believe.

What Mr. Pettigrew claims is "the making of a recess or hollow belt in the hopper of self-discharging saturators to enable the sulphate or other salt to pass to the outlet without obstruction;" but no claim is made with regard to the distribution of the ammonia. The holes in the cracker-pipe placed in the recess, or holes through the side sheet, were to serve this purpose; and it was not apparently in his mind to depart from the usual heavy lead pattern. The cracker-pipe is of the ordinary type; and the wall of the hopper would differ very little in thickness from that of the pipe.

It is an interesting fact that a saturator which enables the sulphate to pass to the outlet without obstruction is shown in the drawing attached to the complete specification of Mr. Duggan's patent of 1896—see "JOURNAL" for March 5, 1897 (Vol. LXIX.), p. 533; and it is evident that the patentee was undoubtedly accomplishing precisely what Mr. Pettigrew did nine years later—the only difference being that in the former saturator the ammonia pipe dips vertically into the acid liquor, while in the latter the ordinary internal cracker-pipe, or holes drilled through the side sheet, serve for the admission of the gases.

Mr. Fenner and I claim that, by our arrangement for the distribution of the ammonia and other gases, the admission passages do not become materially enlarged, and that the sulphate is made equally in the working part of the saturator not for a short time only, or even for a few months, but during the whole lifetime of the saturator; also by our method of distribution many difficulties have been overcome.

Mr. Pettigrew has, I consider, failed to substantiate his charge of infringement. I have adduced evidence to prove that, in practice, the holes in the internal cracker-pipe do become enlarged; and clearly to argue from a false assumption renders his conclusion fallacious.

P. E. WILLIAMS.

Gas-Works, Poplar, E., May 14, 1908.

Prepayment Meter Robberies.

SIR,—A correspondent writing under this heading last week, p. 374, refers to the advantage of a rebate system in connection with slot-meters; and our experiences here may be interesting.

Some five years ago the price of gas was reduced 2d. per 1000 cubic feet; and, instead of altering the slot-meters, the following system was introduced: A rebate of 2d. per 1000 feet to be paid to every consumer in August each year who should have used not less than 10,000 cubic feet in the year ending June 30 preceding.

The plan works satisfactorily. We have never had much trouble with robbery—perhaps because, being a Cathedral town, the inhabitants are all highly respectable. But it has enabled us to largely diminish the unprofitable element—the small consumer. Users of less than 10,000 cubic feet per annum are told that their custom does not pay. In order to make sure of the rebate, people use 13,000 or 14,000 cubic feet; and the average per meter has gone up. People leaving take care to give us notice, in order to make sure of anything due, as we allow *pro ratâ* on three, six, or nine months' usage, if the case is *bonâ fide*. Altogether we are doing better with the rebate than we formerly did without it.

N. H. HUMPHRYS.

Gas-Works, Salisbury, May 13, 1908.

SIR,—With reference to the correspondence in the "JOURNAL," *re* prepayment meter robberies, I enclose copies of notices used by this Company in their prepayment business, which have proved useful in preventing thefts from meters in empty houses.

H. C. HEAD, General Manager.

Winchester Water and Gas Company, May 15, 1908.

[ENCLOSURES.]

No. 1.

The consumer is responsible for this meter, and is required to give the company twenty-four hours' notice in writing before quitting the premises.

No. 2.

THIS BOX IS EMPTY.

The gas will be re-connected upon application at any of the Company's Offices or Show-Rooms.

Right and Left Hand Valves.

SIR,—Mr. Carpenter's letter, in your issue of the 12th inst., raises the point as to what a "left-handed" valve is. Some years ago, I ordered two 24-inch rack-and-pinion valves from a well-known maker, and specified that they should "close with the sun." The maker wrote me asking whether I meant left-hand valves; and I replied in the affirmative—supposing that that was the maker's description of the valves I required. I was, however, surprised to find on delivery that the valves closed against the sun; and I therefore rejected them, in spite of the objection by the maker that I had ordered left-hand valves.

In the works under my charge, all the valves—gas, water, liquor, steam, &c.—are now made to close with the sun; and any that formerly did not do so have been altered accordingly. In my opinion, this is the natural way to close a valve; for no one I imagine would hesitate to close (say) a steam stop-valve except with the sun. I consider it would be a boon to everyone concerned if all valves could be standardized, to close if not with the sun, at least in the same direction.

The only inconvenience I experience with valves closing in this way is that I cannot obtain rack-and-pinion gas-valves from stock, but am obliged to have them made to order.

CHAS. DRU DRURY.

Hendon Gas-Works, Sunderland, May 14, 1908.

Bargoed Coke-Ovens and Bye-Product Recovery Plant.

SIR,—For the information of your readers of the description of the above in the last number of the "JOURNAL," please allow me to add the following financial statement, which appeared in a local paper on the 11th inst., where in the case of an appeal by the Colliery Company before the Assessment Committee for a reduction in the assessment, it was stated that "the undertaking did not bring in more than £100 a year altogether."

OBSERVER.

May 14, 1908.

[ENCLOSURE.]

At the meeting of the Assessment Committee of the Merthyr Union on the 9th inst., the Powell Duffryn Company appealed against an assessment of £3155 gross and £1894 rateable value on certain surface works at their Bargoed Colliery. Mr. C. Kensbole, who appeared in support of the appeal, said it related to an ironfoundry, coal washery, sulphuric acid plant, pattern and fitting shops and smithy, and a siding in connection, with part of the electric generating station and part of the gas-works. All these things were lumped together in one sum; and he submitted that it was absolutely bad, because the appellants were entitled to know what they were assessed at in respect of each of the various items. Having dealt with these separately, Mr. Kenshole remarked, in relation to the gas-works, that they were provided for collecting gases from the coke-ovens and storing them for the purpose of working the electric generating plant. The undertaking was in a very experimental stage, and it did not bring in more than about £100 a year altogether. To avoid litigation or further trouble, he offered, without prejudice, to submit to the old assessment of £1260 rateable value. The Committee, by way of compromise, agreed to reduce it to £1660; but Mr. Kenshole declined to accept these terms.

The Nuneaton Gas Company and its Affairs.

SIR,—I read with interest the remarks made in your "Editorial" of May 5, on the above subject; and, with your permission, I should like an opportunity of replying to them when the matter has been a little further ventilated in your "Correspondence" columns, if this honour is accorded, and the suggestion meets with your approval.

With regard to the letters you publish this week, I have to express the regret I feel at being precluded from answering in your columns anything that Sir George Livesey may have to say as to my attitude on this or any other matter.

Under ordinary circumstances, I should not reply to Messrs. North's letters; but your "Editorial" (which always commands my most

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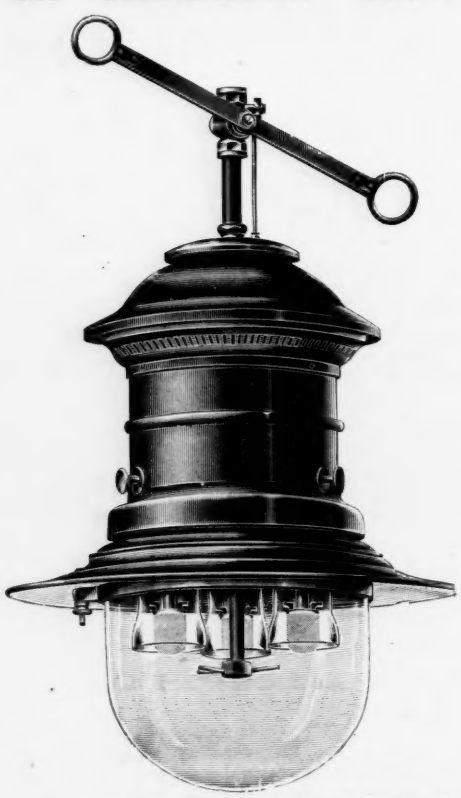

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profound respect) has, to some extent, given their case a significance it does not possess on its own account. Hence these few words.

Mr. Fred North's criticisms (which doubtless included his father's) were answered at the extraordinary meeting he called, and at which the support he received, after circularizing 187 shareholders, meetings in Birmingham, and interviewing discharged workmen, is represented by a holding of £2392, outside his own family, against the Directors and their proxies £21,160. I am, therefore, a little astonished to notice the same cloaked language in the letters referred to, as in most, if not all, previous utterances. I appeal to you, Sir, to persuade all these gentlemen —there appear to be more than I knew of—to uncloak these mysterious word phantoms, and give to our vision form and substance. Then, if the light does not immediately kill them, I fancy very little of my ink will do so.

My letter in your issue of the 5th inst. refers to quite another aspect of the case; and I hope yet, Sir, that the independent thinkers among your readers will become independent actors, and present their thoughts in your columns, whether for or against the position I take up. Those who are not for the defence, might almost as well be in the attack. If the question I raise is not one to command the attention and united front I ask for, let it drop. So far, my ideas of common-sense and self-respect have to account for my action. Let there be no diffidence; I shall not mix principles with men, nor cry at failure.

As I have said, Mr. William North and Mr. Fred North both make charges in general against my Directors—more astute men it would be difficult to find—and myself. They have done so for several years, not months; and at last they seek justification for their actions.

Surely, Sir, there can be only one way to justify an attack on an engineer who has a record of service in the industry of 28 years, embracing intimate experience in no less than six large and small works, excluding consulting work; and that is by making their accusations—no matter how irritated they may feel through loss of dividends or other personal factor—in a form that leaves no doubt as to their real intent, and then either prove or withdraw them, with an apology or without, as they think becomes their station. They need not hesitate on my account; for I am prepared to prove—and let there be no mistake about it—that the Nuneaton working is not only good, but excellent.

A gas engineer's work is not to be measured, as shareholders may think, by the dividends that his company earn alone, but rather by the difficulties he overcomes, and the foundation he puts in for future development. It generally happens that the greater the dividends, the less the work at the particular time they are being paid.

I am prepared to continue the discussion in your columns, or at any open meeting that Messrs. North can arrange; and I agree to allow them any expert assistance they desire, while I will conduct my own case. I make this challenge not boastingly, but on the strength of my own convictions and experience, and because rightly or wrongly I believe this agitation of Messrs. North has bound up in it issues of considerable interest to a large section of the industry; because I know I have a clean case; and because it is in some part a duty owing to the industry which has nurtured me from the beginning, and to the members of it who have given me their support so often.

If any good is to come out of a further discussion of this subject I will not object to it; but I must ask Mr. North to meet argument with argument, and fact with fact. I am not prepared to discuss a part of the matter; it must be discussed as a whole. I am led to make this remark by the sentence contained in the opening of Mr. Fred North's letter, "Neither shall I follow the mazes of Mr. Helps's letter and speeches, nor am I to be drawn aside by 'red herrings,'" which savours of Billingsgate, not argument. If it be remembered that through your "JOURNAL," gentlemen are addressed who know the "rules of the game" and who recognize a "foul," probably only plain unquestionable English will be used.

To assist Messrs. North to regulate their criticisms, I venture to submit, with all respect, the headings under which they may keep their arguments—

Capital 1.—Capital charges, per 1000 cubic feet, and any other reference to capital.

Manufacture 2.—The net cost of coal on works, *plus* labour and purification, less residuals, per 1000 cubic feet.

3.—The amount paid in rates, per 1000 cubic feet.

4.—All other charges, leakage, make per ton, sale of gas and selling price, &c., per 1000 cubic feet.

5.—Profit and loss account.

6.—Loans.

7.—Ecliptic Gas-Light Company, Limited.

Of course, if Messrs. North wish to set out their arguments under different headings I will accept them if I can do so; in any case their arguments must be definite and backed up by figures that appear in any of the balance-sheets for the last ten years, or the working in connection with them. And at the same time they must give the figures and all facts on which they base their criticisms, all of which are obviously best founded on the accounts of some one particular undertaking.

Seeing that Mr. William North's results have been so many times quoted by his son at our meetings, it will not be out of place to express the hope that the working results at Stourbridge will be used as a basis of comparison. Mr. North has always been proud of them; and this will give him an opportunity to show whether the running of his waggons for the Stourbridge undertaking should be on the debit or credit side of his management. Naturally, the engineer making a good profit out of hiring waggons to his concern is in a position to accept a less salary than the engineer who has no such advantage. The figures alone as to his cost of coal and waggon hire for (say) ten years would show better than many word arguments whether or not Mr. North did this outside work to the detriment of his undertaking. Another reason for my suggestion is that I find, no matter how excellent the returns of some engineers, they object to the publishing of their figures.

Accusations appearing in the "JOURNAL" should be definite, if only out of deference to your readers. Therefore, will Mr. North ask the few pointed questions he threatens to ask at a shareholders' meeting (when he can attend it) by means of your columns, as doubtless there they will be better appreciated than when asked before laymen at a shareholders' meeting? In his answer he might throw some light on his dark insinuations as to the Nuneaton Gas Company and the Ecliptic Company.

Mr. Fred North's repudiations should be backed up a little more. For instance—

1. Why was the extraordinary meeting called within five weeks or so of the annual meeting and the presentation of the last balance-sheet?

2. Why has Mr. Fred North attended the meetings and adversely criticized the balance-sheets for seven years when 10 and 7½ per cent. dividends were paid?

3. Mr. Fred North is a shareholder (and in several cases a director) of ten or more other gas companies. Will he say how many of these companies he, or the firm he represents, does business with?

4. Does Mr. Fred North mind stating why, seeing that he could have sold his shares in the Nuneaton Gas Company over and over again at a profit, he has continued to hold them, and at the same time attend meetings and say the Company was not solvent?

Now with a view to preventing figures being quoted in this matter that cannot be borne out, I agree for my part to prove any figures I may use, and to produce them to any member of the industry interested; and I ask all on the other side to give a similar undertaking.

It is only the bedrock of fact that can have interest in this controversy. I fear no attack however relentless, I require no feeble or half-hearted support; and if I have not the support of the industry in these matters—well—may the truth be on the other side.

In spite of the length of this letter, I know I need not ask in vain for your indulgence. I am sure on this occasion you will agree that nothing has been left out that could be put in.

GEO. HELPS.

Nuneaton, May 15, 1908.

Contractors as Shareholders.

SIR,—In your issue of the 12th inst., Sir George Livesey, in connection with Nuneaton Gas Affairs, takes up the cudgels of gas-works' contractors under what he terms "the extraordinary letter" written by Mr G. Helps.

Sir George is, of course, the same as any other man, entitled to his own opinion, which, in this case, is to the effect that suppliers of gas-works' requisites have a perfect right if they think fit to invest their money in gas companies' shares. If this is done simply to secure a good investment of their money, nobody can quarrel with it; but if it is done with a view of influencing business or of "bossing a manager," then there is grave objection.

I beg to bring before the notice of your readers a case where such a contractor's investment was made; and perhaps Sir George will then further let your readers hear from him on the subject.

A gas company had erected a set of four 15 feet square purifiers, together with a 14-inch dry centre-valve to work three boxes on and one off, or all four boxes on. From the commencement of the plant being put to work, the centre-valve was found to be defective—passing unpurified gas in considerable quantities.

The following appears in the minute-book of the company: "Mr. ——, of Messrs. —— attended, *re* the centre-valve of purifiers, and proceeded to examine same; and it was resolved to call a further meeting," &c. The meeting was held; and the following minute was recorded: "Mr. —— and two of his men having examined the valve and connections, were unable to remedy the defects; and Mr. —— informed the directors that the only way to do so would be by the erection of a catch-box as before recommended."

The catch-box was supplied and erected by, and at the cost of, the gas company.

A change of management shortly took place; and the new manager, not being satisfied with matters, again called in Messrs. —— to try once more what they could do with the centre-valve. But, after two trials of several days each, and a considerable interval between each occasion, on the last of which there were three of their best fitters engaged in the work of scraping the valve-faces, it was no better, as was shown by the pressure-gauge fixed on the off-box; and on the inlet valve to the gasholder being opened (before gas making was re-commenced) and gas passed backwards and blown off at the condensers, the gauge immediately rose to full pressure.

Further complaint to Messrs. —— brought forth a letter of which the following is a copy:—

> "I have been away from home for some time; and on arriving home I find a sheet of your gas company's note paper dated—— (which I presume has been sent on here by you) referring to some acetate of lead papers you had sent on. You evidently seem quite incapable of managing any gas-works if you are allowing foul gas to pass into a gasholder through the four boxes and a catch-box. It shows distinctly that, with an arrangement of this kind, you are utterly incapable of understanding the working of purifiers if you cannot keep your gas clean when you have a catch-box to arrest any traces. You are either utterly incapable of managing the works or you are deliberately trying to injure the gas company and get them into disrepute. I have never yet gone past a gas manager to say anything to his directors in reference to a matter of this sort; and I don't want to start doing this now. But, as a shareholder in your company, I shall not allow you to damage the company in the way you are doing, if I have any further evidence of the sort you have been kind enough to send on, which distinctly shows the damage you are doing. Will you, therefore, kindly give proper attention to your business; and if you have not got the necessary information for working your purifiers, try and get it from some of your neighbours, as you will find it is not a very nice thing to be out of a berth because of being discharged for being incompetent."

I need not point out to your readers that the amount of unpurified gas being passed by the defective centre-valve was of a greater quantity than the catch-box supplied with rack-and-pinion slide-valves could deal with even in the summer-time—a test-paper on the outlet being stained black in a few minutes.

The manager of the company in question had a greater share interest in the concern than the writer of the letter quoted.

The query of the whole thing is what caused the gas company, in the first place, to accept defective plant; and, secondly, what prompted them to agree the cost of plant recommended to cure (but failed) the original defect, but as after-events showed was practically useless. The writer of this letter, knowing most of the circumstances of the case, can easily guess the reason.

I await to see what Sir George Livesey, as President of the Society of British Gas Industries, has to say in reply to this letter, and whether he is still of the opinion that such shareholders "can do no harm," but are, as it seems to him, "beneficial." I put aside for the moment the question of influencing business. If he still sticks to his opinion, then I may probably—with the view of converting him, and with your permission, Mr. Editor—follow the matter up by publishing a copy of a later letter from the same person, but on the subject of management in general (carbonization and residuals in particular), in which the writer of the before-quoted letter carried out his threat of going behind the manager to the directors.

While on this subject, allow me to make a strong protest against the action of certain gas-works' contractors in canvassing gas companies who happen to be at the limit of their capital powers, or who for other reasons do not at the moment care to expend more capital, and offering to supply and erect plant, &c., and take up the value of it in shares. Where this is done, it is easy to imagine the position of the manager of the gas-works, as no matter what he may think of the articles supplied, he dare not open his mouth.

Pity the manager whose circumstances place him under the control of a contractor, as the writer has more than once experienced.

May 14, 1908. CLEAN GAS.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills read a second time and committed: Blaydon and Ryton Water (Transfer) Bill, Draycott Gas Bill, Gas and Water Orders Confirmation Bills, Glyncorrwg Urban District Council Bill, Gosport Gas Bill, Leicester Corporation Bill, Swinton and Mexborough Gas Bill.

Bill reported, with amendments: Rochdale Corporation Bill.

The opposition to the Conway and Colwyn Bay Joint Water Board Bill, the Rhymney and Aber Valleys Gas and Water Bill, the Stockport Corporation Bill, and the Wath-upon-Dearne Urban District Council Gas Bill has been withdrawn.

The Blaydon and Ryton Water (Transfer) Bill, Draycott Gas Bill, Finchley Urban District Council Bill, Leicester Corporation Bill, and Lincoln Corporation Bill have been referred to a Select Committee, consisting of the Earl of Kintore (Chairman), the Duke of Wellington, the Earl of Westmeath, Lord Mendip, and Lord Ellenborough; to commence sitting to-day.

Petitions have been presented against the following Bills: The Blaydon and Ryton Water (Transfer) Bill, by the Duke of Northumberland; the Draycott Gas Bill, by the Long Eaton Gas Company; the Leicester Corporation Bill, by the Leicestershire County Council; the Llanelly and Burry Port Water Board Bill, by the Llanelly Rural Parish Council, the Llanedy, Llannon, and Llangennech Parish Councils, and the Guardians of the Poor of the Llanelly Union; and the Margate Corporation Bill, by John W. Dixon and others.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bill brought from the Lords, read the first time, and referred to the Examiners: Huddersfield Water Bill.

Bills reported, with amendments: Audenshaw Urban District Council Bill [Lords], Blackburn Corporation Bill, Garw and Ogmore Gas Bill, Skegness Urban District Council Bill [Lords].

Bill read the third time and passed: Southwell District Gas Bill.

A petition has been presented against the Swansea Valley Gas Bill, by the Swansea Gas Company.

KEIGHLEY CORPORATION BILL.

House of Lords Committee.—Wednesday, May 13.

Before Lord LUDLOW, *Chairman, Lord* ALBEMARLE, *Lord* LIVERPOOL, *Lord* CARNWATH, *and Lord* HILL.)

This is a Bill which proposes, among other things, to empower the Corporation of Keighley to purchase further lands in connection with their water undertaking, to extend the time for the construction of water-works, and to extend the powers of the Corporation with regard to their gas and electricity undertakings.

Mr. HONORATUS LLOYD, K.C., in opening on behalf of the promoters, explained that the most important opposition to the Bill was in relation to the water undertaking, and the lands connected therewith. Dealing with the history of the water supply in the district, he said the first Act was obtained in 1816, incorporating the Company, who were authorized to purchase small springs and supply a population of some 6000 people. The demand for water increased; and the Company constructed further works without powers. In 1865, the Local Board, which was then the sanitary authority of the town, approached the Company with a view to getting the water supply into their hands; and an agreement was arrived at by which the Local Board undertook to purchase the undertaking. Under the new management, the supply was developed. Various Acts were obtained; and on more than one occasion the time allowed for the carrying out of certain works was extended. An agreement was made with the Haworth District Council—from whom the opposition to the present Bill came—to supply them with water in bulk; the minimum payment in respect of which being fixed at £62 10s. per half year. Haworth already had a water supply; but by the agreement they were not to extend their sources of supply, nor were they to apply for further powers for supply. Ever since then Haworth had been entitled to 25 gallons of water per head of the population. But during the 15 years that the agreement had been in existence, they had not required the Corporation to furnish as much as 15 million gallons; and they were obliged to make the minimum payment. Up to the present time, owing to the increase in demand not realizing anticipations, the Corporation had not found it necessary to carry out the works which had been authorized; but the time had now come when these works must be undertaken. In the purchase of lands they were limited to 2300 acres; but they had exceeded these powers to the extent of 857 acres. They were now asking to have their powers confirmed, to be enabled to purchase further lands, and that the time for carrying out the works might be extended.

Some discussion took place as to the time to be allowed to the Corporation for commencing and completing the works.

Mr. *Henry Rofe*, who gave evidence on behalf of the promoters, contended that the time allowed for commencing the works should be two years, because of the possible difficulty with the strata; and they would be completed in ten years. The reservoirs would have storage accommodation for a million gallons of water, and would give a reasonable supply for 25 years.

Mr. *H. A. Johnson*, in giving evidence on behalf of the petitioners, considered that 13½ months would be sufficient limit to allow for the commencement of the works; and they should be finished in seven years. A capital cost of £90,000 to £100,000 would be entailed. If a drought should arise, both Keighley and Haworth would be placed in a very serious position.

After considerable discussion, the Committee held that the works should be commenced within two years of the passing of the Act, and be completed within ten years. If the Corporation should fail to substantially commence the works, their powers in relation thereto should cease.

A clause was agreed with reference to the lands; and when the clauses had been finally adjusted, the Committee ordered the Bill to be reported to the House.

GARW AND OGMORE GAS BILL.

This Bill (*ante*, p. 301) came again before the Unopposed Committee of the House of Commons presided over by Mr. ALFRED EMMOTT, on Thursday, for further consideration.

Mr. *Bell*, the Agent for the Bill, pointed out that at the last hearing the Committee had refused to grant the additional capital, and had reduced it from £40,000 to £30,000. For the convenience of the Committee, not knowing how they proposed to deal with the question, he had prepared two new clauses on the lines of the Model Bill Clauses. He did not know of a single instance of a company applying for the first time for additional capital where Parliament had restricted their dividend to less than 7 per cent. For the first five years they failed to pay any dividend at all; but at the present time they were paying 6 per cent.

The CHAIRMAN remarked that the Committee had dealt very liberally with the promoters in giving them £30,000, which would enable them to go on for 15 years. Their present capital was £20,000, with £5000 borrowing powers. Of this, £15,000 had been spent, and there remained £10,000 unexhausted.

Mr. *E. H. Stevenson* said it really did not matter very much what the dividend might be.

The CHAIRMAN said it would be a long time before the Company wanted to raise any money at 5 per cent.

Mr. *Stevenson* said they would not object to the £20,000 at 7 per cent., and the remainder at 5 per cent. They would be able to pay 10 per cent. before very long. The matter had been adjourned in order to put in a Model Clause—that different shareholders should have a proportionate reduction if the profits did not admit of a full dividend.

Mr. *Bell* said they were only there protecting the public in the matter of the price of gas by putting a limit on.

Mr. MOON said the reduction that was to be made was not in the maximum dividend, and it was not in proportion to the maximum dividend.

The CHAIRMAN said the matter would be gone into later. They would get £20,000 at 7 per cent., and £10,000 at 5 per cent.; and if there was any difficulty about the other point, the question would be brought up again.

LEGAL INTELLIGENCE.

CLAIM IN RESPECT OF A WATER RESERVOIR.

The hearing of the case of *Robinson v. Wharfedale Rural District Council*, which was reported in the "JOURNAL" for April 14 last (p. 110), was resumed in London before Mr. Edward Pollock, Official Referee, on Monday, the 11th inst. The dispute between the Contractor and the Council arose out of the construction of a water-works reservoir at Menston.

After some consultation, Mr. Waugh, K.C., who appeared for the defendants, said that the parties had agreed to the following terms: The plaintiff to withdraw all claims against the defendants under the

action or arising in any way out of the construction of the reservoir; the defendants to be entitled to appropriate the monies and the securities belonging to the plaintiff in their hands in satisfaction of their counterclaim, but agreed that the securities were to be handed back to the plaintiff, if within two months the plaintiff paid to the defendants the sum of £500. No costs on either side.

Disputed Slot-Meter Registration.

At the Slough Petty Sessions, last Wednesday, George Wheeler was summoned by the Slough Gas Company in respect of the amount of 8s., which they alleged was due for gas supplied from July 31 to Nov. 4 last, beyond what was in the money-box of his prepayment meter. Mr. M. L. Walter, the Company's collector, stated that the meter was defective, and that the amount found in it was 8s. less than the value of the quantity of gas registered. It was not until the 1st of November that they discovered the shortage. Witness produced an agreement, signed by the defendant, wherein he consented to pay for the quantity of gas consumed should the meter be defective. Defendant cross-examined witness at some length as to the receipts which had been given, and contended that the gas registered had not been consumed. He complained that the Company did not take away the meter, and replace it when they knew it was defective. After consideration, the Chairman (Colonel Ward Bennett) said the defendant must abide by the agreement; but at the same time he thought the Company had been very careless in the way of giving receipts. Defendant had asked for several receipts, and the least they could do was to give them to him. They had tied defendant down rather severely; but the Bench could not go against the agreement defendant had signed. Whether the gas escaped or was burned, he had to pay for it. Defendant said if Mr. Walter knew the meter was defective he thought it was the Company's duty to take it away and give him another, or cut off the gas.

The Failure of Walter Darby.

A sitting of the London Bankruptcy Court was held last Wednesday, before Mr. Registrar Giffard, for the public examination of Walter Darby, described, under a creditor's petition, as of No. 21, Great Winchester Street, E.C. The debtor, as our readers are aware, promoted, or assisted in the promotion of, a large number of companies to acquire gas and other undertakings in various parts of the country. On the case being called, Mr. W. P. Bowyer, the Assistant Official Receiver, stated that the debtor had not yet lodged any statement of his affairs, nor had he attended under the proceedings. It appeared that he was undischarged from a previous bankruptcy in the Cardiff Court. Proceedings had been instituted against him and other persons by the Official Receiver in Companies' Liquidation, who had reported that the debtor had failed to attend thereunder, and had disappeared, and a warrant had been issued for his arrest. Under the circumstances, and in the absence of a statement of affairs, he asked that the examination be adjourned *sine die*. His Honour made an order in these terms.

Conviction for Stealing Gas-Fittings.

At the Old Street Police Court last Wednesday, Benjamin Snelling was charged on remand with being concerned with two other men, not in custody, in breaking and entering a house in Pritchard's Road, Bethnal Green, and stealing a large quantity of gas-fittings, &c., belonging to the Gaslight and Coke Company. The facts were given in the "JOURNAL" last week (p. 377). The accused pleaded guilty, and asked to be dealt with at once; and Mr. Cluer committed him to prison for six weeks, with hard labour.

Disputed Charge for a Bath.

At the Sunderland Police Court last Wednesday, among the consumers summoned for non-payment of water-rents, was one who said he had been advised to object to the charge for a bath, on the ground that no tap was fixed above it. It appeared that the landlord of the premises in question had unscrewed the taps immediately above the bath, and then advised the tenant not to pay. There were two taps (for hot and cold water) above the lavatory basin, about 18 inches from the head of the bath, the outlet of which was also free. The Chairman of the Bench (Mr. T. R. Blumer) said the legal position was that if there was a bath in the house the occupier must pay for it, whether he used it or not. An order was made for payment in full.

A Gas Collector's Peculations.

At the Southampton Police Court last Tuesday, Henry Lloyd Humphreys, collector in the service of the Southampton Gas Company, was charged with stealing certain moneys, the property of the Company, between the 24th and the 28th of April last. Mr. A. C. Hallett, who appeared for the Company, stated that the charge was of stealing a sum of £21 14s. 4d., which included 5s. 5d., a sum taken from a box under the prisoner's directions and handed to him by one of the witnesses. Accused was a prepayment meter collector, and his duty was to collect the money and bank it every second day. He banked a portion of the money, amounting to £7 3s. 4d., and then absconded with £21 14s. 4d. Mr. F. H. Pitman, the Superintendent of the prepayment collectors, said the prisoner had a salary of 25s. per week. Witness had gone through his books carefully, and they showed that he had collected £28 12s. 3d., *plus* the 5s. 5d. He (witness) had a receipt there for £7 3s. 4d., paid on the 25th of April, and signed by the bank. The difference was the £21 14s. 4d. the prisoner was charged with stealing. A detective stated that on the 9th inst. he received the prisoner into custody from the Farnham police; and on the journey to Southampton he confessed to having been drinking and going too far. He pleaded guilty, and asked the Bench to deal with the case, if possible, under the Probation Offenders' Act. The Magistrates decided to bind him over, under the Act, in the sum of £5 for twelve months; the Chairman (Mr. J. R. Smith) expressing the hope that this would be a warning to him, and that he would keep from drink in future.

MISCELLANEOUS NEWS.

BIRMINGHAM GAS DEPARTMENT.

Changes in the Management—Past Year's Working.

The Birmingham Corporation Gas Committee have issued their annual report—to come before the Council at their next meeting.

Referring to the retirement of Mr. Henry Hack, the Committee remark that he has been connected with the undertaking for 36 years, and has held the position of Engineer-in-Chief since 1902. He attains his 65th birthday on the 29th inst., and retires on superannuation under the terms of the Corporation Superannuation Scheme of 1897. The Committee go on to say that Mr. Hack entered the service of the Corporation in 1876, on the acquirement of the Birmingham and Staffordshire Gas Company, with whom he was officially connected; and they express the desire to place on record their high appreciation of the able, faithful, and strenuous services rendered by him during his long connection with the department. On the retirement of Mr. Charles Hunt in 1902, the Committee rearranged the duties of the then Works Superintendents—promoting them to the position of Works Engineers, and placing in their charge, under the supervision of Mr. Hack, practically the whole of the administration of their respective works. The experience gained by the Works Engineers, and the opportunities which the reorganization in 1902 afforded, have fitted them for more responsible positions; and the Committee have, for the time being, appointed the Works Engineers at Saltley, Nechells, Windsor Street, and Swan Village to the position of "Engineers-in-Charge" of their respective works—the smaller works at Adderley Street to be placed under the general supervision of the Engineer-in-Charge of one of the larger works.

The Committee submit the accounts and balance-sheet for the year ended March 31 last; showing, as the result of the trading, a net surplus of £61,313 to be paid over to the Finance Committee in aid of the improvement rate of the City. The contributions of the department for public purposes during the year are as follows: In aid of the improvement rate, as above, £61,313; in aid of the improvement rate (interest on reserve fund), £4000; in aid of public lighting within the city, £9480; and in aid of court lighting within the city £2281 (making a total of £77,074); and in aid of public and court lighting outside the city, £4546—grand total, £81,620.

The Committee report that they have undertaken, on a scale of charges, to clean and adjust incandescent gas-burners on the premises of consumers, and to supply and fix mantles when required. They point out that incandescent burners, though simple in construction, require to be cleaned and adjusted from time to time if the best lighting results are to be obtained. The policy of the Committee throughout has been to conduct the business of the department so as to secure to customers the best results, whether gas be used for lighting, heating, or motive power purposes; and from the large number of inquiries and applications received from consumers for assistance in this direction, they are satisfied that the burner-cleaning scheme will be a great convenience to the public. The charges have been fixed as under: For cleaning up to 11 burners on the same premises, 3d. per burner per quarter, with a minimum charge of 1s. per quarter; for cleaning from 12 to 15 burners on the same premises, 3s. per quarter; 16 to 20 burners, 3s. 6d.; and 21 to 25 burners, 4s. 2d. Special terms will be quoted where the number of burners to be cleaned on the same premises exceeds 25. The burners on consumers' premises will be cleaned and adjusted at least twice during each quarter. Men have been carefully selected and specially instructed for this work; and therefore the consumers may feel assured that they will carry out their duties efficiently and expeditiously, and in a cleanly manner.

The Committee record with regret that on Sunday, the 1st of March last, an explosion of gas occurred in the exhauster-house at the Windsor Street works, which unfortunately resulted in the death of two workmen named George Willis and Alfred J. Ward, and injury to a third man named Charles Edgington. The explosion wrecked two Livesey washers; and the resulting fire destroyed the roof of the exhauster-house. The damage done to the building and plant is estimated at £2000, covered by insurance to the extent of about one-third. The amount of compensation due to the representatives of the deceased men has been agreed—in the case of Willis at the sum of £199 4s., and in the case of Ward, who left a daughter only partially dependent upon him, at the sum of £25. Edgington will be compensated during the period of his incapacity, which it is not anticipated will be protracted. At the Coroner's inquiry into the cause of the death of the two men, the Jury, after due deliberation, returned a verdict of "Accidental death." The Committee bear testimony to the gallant attempts made by members of the City and the Aston Fire Brigades to rescue the deceased men from the flames in the trench, and to the excellent services rendered by them in extinguishing the fire.

The Committee also regret to report that on the 7th of December a workman named Thomas Perrett was fatally injured at the Lawley Street goods station of the Midland Railway Company. He left a widow; and compensation amounting to £227 2s. 8d. was awarded her under the Workmen's Compensation Act, 1897.

GAS-METER TESTING IN MANCHESTER.

The Index Test.

In his fifteenth annual report to the Manchester City Justices, Mr. S. Dyson, the Official Inspector of Gas-Meters, says the number of meters tested during the year to March 31 was 38,424—a decrease of 5444 compared with the previous year. The fees received amounted to £1452; being a decrease of £217. This is accounted for chiefly by the diminished demand for penny-in-the-slot meters. The amount

expended on equipment last year was £306; and this, together with the ordinary expenditure of £1913, makes a total of £2219.

Of the total number of meters tested, 605 were rejected, or 1·59 per cent. The figures for wet and dry meters were: Wet meters tested, 12,152; rejected, 238 (2·08 per cent.). Dry meters tested, 26,272; rejected, 367 (1·41 per cent.).

The following table shows the number of meters rejected by the "index test" (which is in operation in Manchester). Mr. Dyson points out that the errors could not have been discovered by the test of the measuring chambers as specified by the Sale of Gas Act, 1859:—

Table Showing Cause of Defects in Meters Rejected by "Index Test."

Upright Shaft Out of Action with Drum Shaft.	Incorrect Number of Teeth in Index Wheels.	Defective Front Plates and Inaccurate Marking.	Damaged Fittings and Worms.	Index Wheels Out of Action.	Total.
5	6	18	19	9	57

Mr. Dyson adds that the Gas-Meter Testing Committee of the Manchester Justices have for a number of years endeavoured to get the Act of 1859 amended; and last year the Board of Trade issued a circular-letter asking the Committee for any observations they might see fit to offer as to the adequacy of the provisions of the existing Acts in regard to the present testing requirements. A full and complete report, with suggestions, was supplied to the Board; the most important point being the necessity for the compulsory testing of the indices of meters. It is believed that the Board are now considering the reports upon the subject made by the various authorities throughout the country in response to an invitation by the Standards Department; and the hope is expressed that the result will be legislation in the near future making the testing of gas-meter indices compulsory.

Appended to Mr. Dyson's report are photographs of the various working departments of the station, two of which were reproduced in the "JOURNAL" for May 21 last year (p. 519).

BOLTON GAS PROFITS AND THE RATES.

The Bolton Corporation Gas Committee have acceded to the request of the Finance Committee to allocate the sum of £20,000 out of the profits of the department in aid of the rates for the current financial year; but they express the opinion that, in view of the depression in trade and extra renewals to be carried out during the present twelve months, a sum not exceeding £17,500 will be available for transfer next year. This decision was arrived at when the Gas Committee met last Friday week, and following upon a discussion as to what had been said on the subject at a meeting of the Town Council held on the previous Wednesday.

It had been proposed by the Gas Committee, after mature deliberation, to hand over this year £17,500 out of the profits in relief of the rates; but at the Town Council meeting it was argued that unless a larger sum was allocated there was every probability of an increase in the rates, which the Finance Committee were anxious to avoid. There followed a discussion on the question of how the surplus profits of the Gas Department should be dealt with. Some argued that the consumers should have the advantage in a reduction of price; but they were in the minority. Alderman Wild, the Chairman of the Gas Committee, pointed out that the department's contribution in aid of the rates was really about £25,000. Among other things, £2629 was saved by a change in the burners used for street lighting. Alderman Haslam said that for several years now £20,000 had been allocated out of gas profits for "special purposes;" and he asked if this plea was to be advanced each year. It was his opinion that in some respects matters were being conducted in a most unbusinesslike way. No firm would think of borrowing money to replace machinery which had not been properly depreciated. Finally Alderman Wild accepted an amendment referring the matter back, with the result stated above.

COST OF STREET LIGHTING IN BRADFORD.

At one time the whole of the cost of lighting the streets of Bradford was defrayed by the Gas Committee—in other words, by the gas consumers; but some years ago it was decided that the Corporation should pay the Committee £26,000 a year for the purpose, and this naturally enabled them to reduce the price of gas. It is calculated, however, that the annual cost of the street lighting is now £31,000; and, under these circumstances, the Gas Committee sought further assistance from the Corporation. The result was that at last week's meeting of the Council minutes of the Finance and General Purposes Committee were submitted for confirmation which contained a resolution deciding that from the 1st inst. this Committee should determine the character of street lighting, and defray the whole cost.

Several members designated as "unbusinesslike" the proposal that the duty of looking after the street lighting should be taken away from the Gas Committee, who were specially qualified for it, and placed in the hands of the Finance Committee; and there was some objection also to the suggestion that the whole of the cost of the lighting should be defrayed by the Corporation. The case was, however, put clearly by Mr. Smith, who pointed out that there were large business premises in the city where no gas was consumed; and if the streets were lighted at the expense of the Gas Committee, it meant that those ratepayers who did not consume gas enjoyed street lighting without making any contribution towards it. Of course, it was not intended that the Finance Committee itself, who knew nothing about street lighting, should take control, probably a small Committee of half-a-dozen members—two members each from the Finance, Gas, and Electricity Committees—would be formed to carry out the resolution; and he could not imagine a more businesslike or workable Committee. Mr. H. Geldard, Chairman of the Gas Committee, said his Committee had had to face tremendous difficulties during the past year owing to the higher price of coal, which had involved an expenditure of £14,892 in excess of the previous year. At one time it seemed impossible that there should be a profit. In addition to the profit that was actually made, however, there was a sum of between £4000 and £5000 swallowed up in street lighting, for which nothing could be shown. He thought a small Committee such as Mr. Smith suggested would find the management of the lighting excessively onerous. If the Corporation granted the Gas Committee this additional £5000, they could be relied on to use the money well. Mr. Godwin held that the consumer should not be taxed to relieve the ratepayer. Mr. Wade, the Chairman of the Finance Committee, supported the minute, on the ground that if it was right for his Committee to pay a portion of the cost of street lighting it was right for them to pay the whole.

An amendment referring the minute back to the Committee was defeated; and Mr. Wade promised that consideration should be given to a suggestion that the Gas Committee should allow the Finance Committee the same discount as was allowed large private consumers.

BOMBAY GAS COMPANY, LIMITED.

The Ordinary Meeting of this Company was held last Thursday, at the London Offices, No. 6, Drapers' Gardens, E.C.—Mr. H. E. JONES in the chair.

The SECRETARY (Mr. A. Dickson, jun.) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

The CHAIRMAN, in moving their adoption and the declaration of a dividend of 3½ per cent. (free of income-tax), making 6½ per cent. for the year, said the chief blot on the report and accounts related to the dividend. It was his melancholy duty to move a dividend of ½ per cent. less than for the previous year; and he did this with a great deal of regret. He thought, however, when he had finished telling the shareholders about the progress of the Company, they would perhaps say the Directors ought not to have proposed this reduction, but should have paid the full amount. It would be quite a legitimate question to ask why the Directors had done this; and he would anticipate the question by giving an answer. There had been considerable extension of the consumption of gas; and it would be seen that there was an increase of £5400 in the receipts for gas, public lighting, residuals, and other things. With regard to capital, they had not added a single penny to the expenditure during the year, which was very unusual when a company was increasing. It would be seen that the income from gas and public lighting was about £3000 more, and from residuals rather above £2000 more, following as coke did the higher price of coals. Concerning the rather fortuitous amount under the heading of bad debts, they wrote off in the previous year more than the loss they actually incurred through the defalcations of the collector. That was in favour of the Directors. The increase in the income of £5400, it might be said by those who were familiar with gas undertakings ought to have given an increase of profit of about one-third, or (roughly) £1800. But if they would look on the expenditure side of the revenue account, it would be seen that the expenses for coal amounted to about £18,000, as against £15,000 in the preceding year, or some £3000 more. Most of the other items in the accounts could be passed over as being what might be expected. The wages were heavier, because the price of food had gone up very much in Bombay; and they had increased the allowance to the workmen for food. This was a righteous thing to do; and had they not done it, it might have proved a great disadvantage to the Company. However, it increased the wages. Purification costs were also higher by about £250. The chief source of extra expenditure, however, which had prevented them getting the £1800 profit they should have had under ordinary circumstances out of the increase of income was in respect of repairs and maintenance of works and plant, and of mains and services. With regard to something like £1600 of the works expenditure under this head, and nearly £900 of the distribution expenditure, under the circumstances that their works had been rather neglected by the late management, the Directors had taken care to secure certain extensions which ordinarily would have been looked upon as improvements chargeable to capital. They, however, charged the amount against the revenue account this year, because of the state of things at the works, which state had been and still was occupying the serious attention of the Board. It would also necessitate further expenditure this year. They had contracts out now for renewing one of the gasholders, which was a heavy repair to undertake in one particular year. With this work before them, and the dark outlook for coal (the Directors were considering this matter some months ago), they came to the conclusion that it would be in the best interests of the Company to let the Board keep a little in hand, and to forego ½ per cent. of the dividend. He had sat in the chair of ten different gas companies; and in the whole of his many years' experience, he had never before had to move a reduction of dividend, and he did not think he should have to move it again in that room. The condition of the Company with regard to its outlook for business had never been better—in fact, it was so good, they were almost afraid to count upon it. Last year, there was an increase of 16 per cent.; while their average percentage increase had previously been about 2½ per cent. The larger increase had come about from several causes. There had been, and was now, a considerable trade in Bombay, though they had lost one or two rather important consumers. They had sent out a young Engineer and Manager, and had impressed upon him to see if he could produce the same results in Bombay as they had found produced on the Continent, in England, and elsewhere, in stimulating the consumption of gas for purposes other than lighting. This had meant that they had had to lay larger mains, the cost of which had gone into the revenue account; and they had had to lay mains in fresh quarters, which had also been charged to that account. They had removed their offices into a better position, and had enlarged

them very much; and this had helped to bring the Company to the front. The Municipality had also arrived at the conclusion that it would be better to light the streets throughout the months, instead of suspending the lighting, as formerly, during moonlight nights. This would improve the lighting of Bombay; and it brought to the Company the important advantage that they no longer had their plant lying idle on moonlight nights. Of course, the public lighting formed a considerable fraction of the total of their gas consumption. The Directors had just sent out a cheque to their Manager, as his increment on securing additional lighting; and he was putting energy into getting new custom. He asked the Board to send out various appliances for employing gas for heating purposes; and he was showing enterprise in introducing every new kind of gas lights—especially those of the inverted type, which if introduced earlier would have saved the Company the loss of one very important customer. Their Manager promised that this increase should continue. If it did, then they might soon bid "good-bye" to the small dividend of 6½ per cent., as they would not be asked to surrender any part of their dividend in the future. The office management in Bombay had, since the troubles of a year-and-a-half ago, seriously occupied the attention of the Board; and they had had the advantage in the matter of a Committee of the Deputy-Chairman (Mr. W. G. Bradshaw) and Mr. Louis Penny, who knew the local circumstances. As a consequence, they had very much improved the condition of affairs in Bombay. A new system of book-keeping had been introduced; and the local Auditors' duties had been extended, and they were being paid larger fees for a more complete performance of their duties. Everything now pointed to the saving of a repetition of the miserable story he had to tell last year of deceit, fraud, and neglect. But there was the further bright prospect before them that their Manager (who was well qualified for such a purpose) could renew in Bombay the experience he had in Uxbridge and Stepney, by introducing gas where formerly they hardly imagined they could get it used. It was a grand thing for the shareholders to be responsible for the lighting of one of the most important cities of the Universe—a city teeming with an enormous population, whose habits were so different to those of Europeans, and whose conditions generally excited the greatest interest. But their undertaking was 5000 miles away; and the Directors could not visit the works as they would like to do, and look after them on the spot. All they could do was to send out men who would give to the Company the benefit of their knowledge and their years. They had such men serving them now, who would look to the development of the uses of gas in this distant, this important, and this interesting city, in a way which he (the Chairman) ventured to prophesy would inure to the great benefit of the shareholders. He did not tell fancy stories in these matters, but he had full confidence that the shareholders would get much better dividends than in the past, that Bombay would be lighted by the Company in the most brilliant way for many years, and that gas would there hold its own as it did at home. In concluding his remarks, the Chairman referred to an article in "The Times" of the previous day on the new metallic filament electric lamps, and expressed the opinion that they would not, in any way, for reasons stated in that article, affect gas lighting.

The DEPUTY-CHAIRMAN (Mr. W. G. Bradshaw), in a few words, seconded the motion.

Mr. CUFF said he must express satisfaction with all the Chairman had told the shareholders. The particulars given had been very interesting. With their satisfaction, they could not restrain a little condolence with the Chairman and Board in the great disappointment felt in having to reduce the dividend. There was only one remark he would make in reference to the accounts. The shareholders were sorry to see the large increase in the expenses; but at the same time he quite approved of the caution of the Board. On reading the report, it looked as if some of the expenses might have been charged to capital; but he thought the Directors had acted wisely in charging these special expenses to revenue instead.

The motion was unanimously carried.

The DEPUTY-CHAIRMAN proposed that Mr. H. E. Jones and Mr. Charles Hunt be re-elected to their seats at the Board. He remarked that he thought the shareholders might be proud in having such Directors as Mr. Jones and Mr. Hunt. He was not exaggerating in the very least in saying that what Mr. Jones and Mr. Hunt did not know about gas undertakings was not knowledge at all. They congratulated themselves that they had now gentlemen of such long experience and such proved ability looking after the management of the undertaking.

Mr. LOUIS PENNY seconded the motion, which was unanimously carried.

On the proposition of Mr. CUFF, seconded by Mr. SAMUEL SPENCER, the Auditors (Messrs. S. G. Browne and J. Hill Perrins) were reappointed.

Moved by Mr. W. WILLIAMS, and seconded by Mr. A. W. OKE, a cordial vote of thanks was passed to the Chairman and his colleagues. In the course of his remarks, in proposing the vote, Mr. Williams stated that one thing which particularly struck him in the course of the Chairman's speech was that nothing (save for meters) had been carried to capital account. This meant that they had improved their position and business without increasing their liabilities.

The CHAIRMAN, in the course of his acknowledgment, said Mr. Williams had unconsciously reminded him that they could not go on sending out gas stoves, fittings, and meters, and continue to enlarge their works and distribution system, without the use of capital. There was a small margin of uncalled capital in hand, which would enable them to go on until the Board could give the shareholders some sure indication of the policy to be carried out, when they would have to ask them to authorize an enlargement of capital. They were not, however, in immediate need of anything of the sort.

Mr. CUFF then moved, and the CHAIRMAN seconded, a hearty vote of thanks to the Engineer and Manager (Mr. A. R. Burch), to the staff and workmen in Bombay, and to the Secretary and staff in London. Great appreciation was expressed with the work of reformation that had been going on.

The motion was unanimously carried.

Mr. DICKSON briefly responded on behalf of himself and staff and his colleagues in Bombay.

This concluded the proceedings.

GAS-WORKS EXTENSIONS AT ILKESTON.

In the course of an inquiry by Mr. F. H. Tulloch, on behalf of the Local Government Board, with reference to an application by the Ilkeston Corporation to borrow further money for gas-works extensions, the Town Clerk (Mr. Wright Lissett) said the undertaking had been in the hands of the Local Authority since 1879, and had proved of great value. The plant and property were worth not less than £150,000, with an outstanding debt of about £62,000. The proposal of the Council was to expend the sum of £19,974, for which the sanction of the Local Government Board was now sought. The plans submitted provided for a new retort-house, a gasholder, and a coal-store; and there were also certain machinery and appliances required. As showing the progress of the concern, he stated that the gas made in 1907 was 103 million cubic feet; and up to March 31 last, 108 millions—showing an increase of 5 millions. In 1907, the income was £12,204; while in 1908 it was £13,290—being an increase of £986. The total expenditure in the year 1907 was £10,179; and in 1908, £10,684—an increase of £505. The number of consumers in 1907 was 4778; and in 1908, 5036. The gas-works were purchased when the selling price of gas was 4s. per 1000 cubic feet; in 1907, it was 2s. 6d. per 1000 feet. In 27 years there had been paid to the general district rate for the benefit of the ratepayers £18,105. The outstanding liabilities on capital were £61,872, which was the net debt. The aim of the Council in the present application was to provide means to produce the maximum amount of gas at the minimum of expenditure.

BURTON-UPON-TRENT GAS UNDERTAKING.

The Past Year's Working—New Financial Era.

At the Meeting of the Burton-upon-Trent Town Council last Wednesday, the report of the Gas and Electricity Committee for the past financial year was presented. The balance-sheet, signed by the Borough Treasurer (Mr. Oswald W. Arnold) showed that the revenue from the sale of gas was £41,358, compared with £40,785 in the year 1906-7; that the residual products realized £13,259, against £11,049 (coke fetching £2337 more); that the stores were valued at £2128, compared with £675; and that the total income was £63,156, against £58,302. On the expenditure side, coal cost £20,003, compared with £14,974; and stokers' wages, &c., came to £5352, against £4959. Purification, however, cost only £1010, compared with £1343. The increase in the item for coal was due to heavy purchases last summer and the advance in price; but the item is balanced by the greater value of the stores. The surplus, after paying interest, making the usual contribution to the redemption fund, and repaying loans was £12,223, and it was appropriated as follows: Extension of work and plant, £2446 (including £742 for retort-house governors and tar-towers); general district rate, £6500; and reserve fund, £3277. Noteworthy features of the working last year, under the supervision of the Assistant Manager (Mr. R. S. Ramsden), were the sale of 10½ million cubic feet more gas and 751 tons more coke with 85 tons less coal carbonized, and the reduction of the unaccounted-for gas to 5¼ per cent. of the make—a great improvement compared with a few years ago.

Alderman LOWE, in moving the adoption of the report, first dealt with the portion referring to the supply of electricity, and afterwards with that relating to the gas undertaking, which he said contained several features of more than usual interest. For several years he had had to report that the sales had shown a retrograde tendency. Now he was glad to say they had to record a small but definite increase. It looked very much as if the tide had turned, and 3 per cent.—though a moderate advance—was one which was at any rate in the right direction. Perhaps what was even more interesting was that they had been able to obtain this with a smaller quantity of coal carbonized. The Committee looked for still further improvement in the yield of gas per ton of coal as the works were brought up to date. It must, of course, always be remembered that as the yield increased there was usually a drop in the candle power; but reduced illuminating value was a policy which had been adopted by most of the progressive gas undertakings in the country. He mentioned this because they had had a complaint from the Trades Council as to the low illuminating power of their gas. They had pointed out in reply that as gas of this quality was just as efficient for incandescent lighting, and also for heating and power purposes, as a more expensive gas of higher light-giving quality, they considered it to be in the best interests of the ratepayers of the town to adopt the policy now followed of manufacturing gas of comparatively low candle power. If, however, the consumers should consider this too low, they must always bear in mind that the ratepayers reaped the full advantage of it in the increased yield of gas per ton of coal carbonized. Another point of exceptional interest in connection with this year's accounts was that, though the price of coal averaged 2s. per ton more than the previous year—which meant something like £3500 extra outlay—they had made the same profit, within a few hundred pounds, as they did last year. This was largely due to the higher price obtained for coke and the increased quantity they had to dispose of. As a matter of fact, they carbonized less coal than in the year 1906-7, and sold 751 tons more coke. This was a figure which would be improved upon when the works were reconstructed. These were all interesting facts. The total gross profit amounted to £20,700, or nearly 10 per cent. on the invested capital, which left £3277 to be added to the reserve fund, after nearly £2500 had been spent on extensions and renewal of plant, and £6500 contributed to the relief of rates. This brought him to the somewhat important subject of their reserve fund, which stood at just over £22,000, and with the deterioration fund amounted to £34,000, or about two-thirds of the outstanding amount of the whole capital which had not been repaid. They were entering upon a new era so far as their gas undertaking was concerned. They should now reap the reward of a cautious policy which they had steadily followed for ten years. By building up their reserves, they would be able to change their position, and, instead of generally charging rather more than the average price for their gas,

be able to sell it at something lower than this, and still continue to make a substantial contribution to the rates. It should be understood that this was not the result of any sudden change of policy or management, but rather of a steadfast adherence to cautious action spread over a number of years. He might mention that in the very near future he hoped to come to the Council with a recommendation for a substantial reduction in the price of gas for lighting purposes. They had paid over £53,000 in the last five years, which was equal to 25 per cent. of the whole amount invested in the gas undertaking. The position of the undertaking was not a strong one five years ago; but it had now been transformed into one which would enable the Committee to face the future without apprehension.

Mr. HUTCHINSON expressed pleasure at the promised reduction in price, but said he would have been glad to have something more definite than the "very near future" in regard to the date. He thought that even now the Committee might easily make a substantial reduction in price without any risk to themselves. It was all very well to say that working men should adopt incandescent fittings; but while he himself could use mantles for nine months, it was no easy matter for a working man with half-a-dozen boisterous children to do so.

Mr. WARDLE said he was satisfied the Committee were doing the right thing. He did not think the working people of the town were behindhand in the use of incandescent mantles. If they got 3d. per 1000 cubic feet off the price, they would obtain an enormous reduction. He appealed to the Council to help them to improve the gas plant and make the whole concern a credit to the ratepayers.

Alderman LOWE, in replying, said the South Metropolitan Company supplied gas of 12-candle power compared with their own 14-candle gas. In regard to Mr. Hutchinson's query, he thought he might be able to fix the date of the reduction at the July Council meeting.

The report was adopted.

A SUCCESSFUL YEAR AT HINCKLEY.

The report of the Gas Manager (Mr. Fred Lee) on the working of the Hinckley Urban District Council gas undertaking for the year to March 31 last states that the total receipts amounted to £13,911, and the working expenses to £8023, leaving a gross profit of £5888. After deducting £1247 for interest, and £1135 placed to sinking fund account, there is a net profit of £3506, or £503 more than for the preceding year. The amount spent on capital account was £1314; and this has been paid out of profits. During the year loans amounting to £381 were repaid; and there is a balance of £916 in the sinking fund, which will be used for repayment of loans during the current year. The increased receipts for gas and meter and stove rents were £532; and coke realized £357 more. During the year £260 was transferred to the general district rate. The quantity of gas manufactured was 73,640,000 cubic feet, compared with 70,314,000 cubic feet in the previous year; and the amount sold was 71,240,400 cubic feet, being 3,379,100 cubic feet, or 5 per cent., more. Some 1,098,000 cubic feet were used on the works, leaving 1,301,600 cubic feet, or 1·76 per cent., unaccounted for. The number of ordinary meters increased from 1377 to 1423, slot meters from 1017 to 1128, and cookers on hire from 979 to 1100.

The Gas Committee recommended that the price of gas to consumers paying at present 3s. per 1000 cubic feet net and upwards (with the exception of weekly consumers) be reduced 2d. per 1000 cubic feet, and that in the case of weekly consumers the reduction be 1d. per 1000 cubic feet; and that in all cases of slot consumers having cookers and using 3500 cubic feet or over per quarter, they be allowed a stove rent of 1s. per quarter. The Committee also recommended that a sum of £260 be transferred from the gas profits to the general district rate account (this amount being equal to a rate of 2d. in the pound); and that gas-fittings be fixed in the houses at Burbage without cost to the consumer, in the same way as at Hinckley, provided the consumer agrees to rent a gas-cooker.

The adoption of the report and recommendations by the Council was moved by Mr. Kinton, who remarked that the year had been a most successful one, and the profits had been more than in any previous year. The result of the working reflected the greatest credit upon the Manager. He was afraid, however, they had about reached the maximum, as far as consumption in Hinckley went. Ten years ago, the price of gas was 3s. 6d.; and if the Committee's recommendations were adopted it would be reduced to 2s. 10d. One thing that had helped them considerably had been the large purchase of coal which the Committee made in 1906, which was owing to a great extent to the foresight of the Manager and Committee. The Manager had estimated that the rise in the price of coal would cost them something like £800 extra this year. As to the distribution of profits, which had been a debatable matter for a long time, some members had advocated a sum being transferred to the relief of the rates, and this had been acted upon for two years. This year, they found themselves in the happy position of being able to do the same, and reduce the price of gas also. Their present liabilities were only £37,000, and he believed it had been said some time ago that if the concern was in the market, it would realize £100,000, which would almost pay every debt of the Council. It was a good thing the town possessed such an excellent concern. The reduction in the price of gas would absorb £500; but in this matter Hinckley compared favourably with other towns of its size—the price at Coalville being 4s. 2d., at Loughborough 3s., and at Brierley Hill 3s. 2d. per 1000 cubic feet.

In seconding the motion, Mr. Hunt congratulated Mr. Lee upon the very excellent report presented, and also the Committee upon seeing their way to make the reduction in the price of gas. They had not gone so far as he would have liked, however, as he had anticipated that they would have been able to make a reduction of 3d. per 1000 feet; but he hoped that the other 1d. would be taken off in the near future. Could not the Council see their way to make the reduction 2d. all round? It seemed that by the Committee's proposals one class would get a reduction of 2d., and another only 1d. He did not think that by placing all consumers on the same footing they would lose anything, for there would probably be more gas consumed.

Mr. Bott said the Committee went thoroughly into the question, but could not see their way to reduce the price further, especially as they were faced with something like an additional £800 in the cost of coal. Mr. Cholerton thought the time had arrived when the meter-rents might be abolished, as it was a most vexatious charge. With regard to the transfer of £260 to the relief of the rates, he was not quite convinced that this would be the best way of dealing with the profits made, as the landlord of small houses would get a relief in rates for those houses, and through him the tenants, who probably did not use gas. He did not propose to move an amendment; but he should be pleased if, before another report was presented, the Committee would consider the matter. Mr. Pratt hoped when the Committee took into consideration the abolition of meter-rents, the owners of the meters would be considered also. It would be unfair to abolish the rents if the owners were not to get some advantage.

The Committee's recommendations were then adopted; and it was decided to give the Manager permission to attend the meetings of the Gas Institution next month in London and Berlin, and (in view of the satisfactory report he had presented) to allow him ten guineas towards his expenses, instead of the six guineas suggested by the Committee.

ROTHERHAM CORPORATION GAS UNDERTAKING.

The Past Year's Working.

In the last number of the "JOURNAL," we gave a few figures as to the working of the gas undertaking of the Rotherham Corporation in the past financial year. The following is the report which the Engineer and General Manager (Mr. J. S. Naylor) submitted to the Gas Committee, and which furnishes fuller particulars: "The quantity of coal carbonized during the year was 24,400 tons, at a cost of £12,474, against 23,426 tons, costing £10,275, in 1906-7—an increase of 974 tons and £2199. We have, however, received a sum of £980 more for residuals. The quantity of gas made was 295,958,000 cubic feet, against 287,856,000 cubic feet before; being an increase of 8,102,000 cubic feet. The gas made per ton of coal carbonized was 12,130 cubic feet, compared with 12,287 cubic feet. The quantity sold was 267,698,000 cubic feet, against 256,696,000 cubic feet; being an increase of 11,002,000 cubic feet, which is equivalent to 4·1 per cent. The gas unaccounted for was 24,611,000 cubic feet, or 8·31 per cent., against 27,595,000 cubic feet in 1906-7, or 9·58 per cent.; being a decrease of 1·27 per cent. The illuminating power of the gas sent out during the year was maintained of uniform quality, and the impurities were kept low. A sum of £400 has again been provided out of the year's profit to defray the expenses for the extra examination of mains and services, which largely contribute to the reduction in leakage. The works and plant were maintained in good repair and thorough working order out of revenue; an extra sum of £300 being expended on the retort-house and retort-benches through the settlement of foundations. The revenue from gas sold was reduced by more than £1000, owing to the reduction in the price of gas which took effect on the 1st of October. The gas for public lighting, including wages and maintenance of the lamps, amounted to £4518, against £3928 before—an increase of £590. This is attributable to the extra number of lamps lighted in accordance with instructions from the Council, and also the taking over of the Blackburn lighting by the Gas Department. The number of lamps lighted in the year was 1208, against 1016 in 1906-7. The cost of gas only for public lighting amounted to £2338, against £1973. The balance owing to the bank is £2435, compared with £5770—a decrease of £3335; a satisfactory feature of this reduction being a saving of £230 on bank interest. The sum allowed for depreciation is £16,926, against £18,188. The amount of gross profit made is £16,926, compared with £18,188. The net profit, after allowing for interest, redemption, and sinking fund, amounts to £7431, compared with £8474. If the gas for public lighting (£2338) is again given by the department as in former years, there remains an available surplus profit of £5093."

In addition to his report, Mr. Naylor submitted a table showing the income and expenditure of the Gas Department, per 1000 cubic feet of gas sold and per ton of coal carbonized, for the past compared with the preceding year. From this we take the following figures for 1907-8:—

	Total. £ s. d.	Per 1000 Cubic Feet Sold. s. d.	Per Ton of Coal Carbonized. s. d.
Revenue from gas and public lighting	37,613 3 5	2 9·72	30 9·96
Net cost of gas.	20,686 6 1	1 6·55	16 11·47
Gross profit	16,926 17 4	1 3·17	13 10·49
Interest, sinking fund, &c.	9,495 15 11	0 8·51	7 9·40
Net profit	7,431 1 5	0 6·66	6 1·09
Less gas for public lamps	2,338 16 3	0 2·10	1 11·00
Surplus profit	5,092 5 2	0 4·56	4 2·09

Before the amount of profit was stated, the following provisions were made: Renewal of works, £680; mains and services (each), £200; rebates to automatic consumers, £200; bad debts, £150.

As already mentioned, the report came before the Town Council on the 6th inst., and the Gas Committee recommended that the available surplus profit of £5093 should, as far as possible, be utilized for the purpose of wiping out the adverse balance at the bank and in the reduction of the capital account; the gas consumer already bearing the cost of public lighting, representing £2338, or equal to 3d. in the pound. Subsequently, Mr. J. Beckett, in submitting the minutes of the Finance Committee containing the results of the working of the different departments and the recommendations of the Committee in connection with the various surpluses and the levying of the rates for the current year, moved, as an amendment, that £4000 of the gas profits should be allocated to the relief of the general district rate. After some discussion, however, the amendment was rejected, and it was decided to use £2500 of the profits for relieving the district rate, and £500 for reducing the deficiency on the water-works account.

On the same occasion, as reported last week, the Council adopted unanimously a recommendation of the Gas Committee to raise the Engineer's salary by £100, in two instalments of £50.

EVESHAM CORPORATION GAS UNDERTAKING.

The Past Year's Working.

At the Meeting of the Evesham Town Council last Wednesday, Mr. Fisher, in moving the adoption of the minutes of the Gas Committee, gave particulars of the working of the undertaking in the past financial year. He said the total receipts shown by the revenue account amounted to £8941, which was an increase of £826 on those for the year 1906-7; while the expenditure was £6639. This left a balance of £2302. The receipts included £3904 from the sale of gas to ordinary consumers, £1798 from those using prepayment meters, and £1893 from residuals. The first two items were increases of £139 and £410 respectively. The expenditure during the year had been heavier than usual, owing chiefly to the increased price of coal, the total cost of which amounted to £2694, against £2218 in the previous year, or an increase of £476. He was pleased, however, to be able to state that the balance of the revenue account (£2302) showed an increased gross profit of £224 compared with 1906-7, which was disposed of as follows: £586 was written off the capital account for the extension of mains, plant, and stoves; £106 for meters; and £46 for the sulphate plant. Interest on loans absorbed £81, and the instalment paid off loans £788; leaving a balance of £695 to carry to the profit and loss account. In dealing with the balance-sheet, he said £656 had been expended on stoves, prepayment meter installations, mains, &c., during the year, and £266 on new meters. The discounts allowed to consumers for prompt payment of their accounts amounted to £594. He thought the Council would agree with him that the progress made during the year had been satisfactory, and that they might congratulate themselves on the sound financial condition of the undertaking. A great deal of the success was due to the ability and energy of their Manager (Mr. Percy H. Fletcher). The minutes were adopted.

PUBLIC LIGHTING OF WINDSOR.

Combination of Gas and Electricity.

At the Meeting of the Windsor Town Council last Wednesday, tenders for the public lighting of the borough, submitted respectively by the Windsor Gas Company and the Windsor Electrical Installation Company, Limited, were under consideration.

The Gas Company quoted £1193 13s. 6d. per annum for lighting the town with gas for five years from April 1, 1909; 280 single burners (for ordinary standards) to be lighted from one hour after sunset to one hour before sunrise, and 38 triple burners (for large standards) to be lighted from one hour after sunset until midnight, when two burners would be extinguished, leaving one alight until one hour before sunrise. The tender, which was signed by the Secretary (Mr. J. H. Strange) set forth that the Directors had taken great trouble in regard to the matter, by personal and other inquiries in towns where the public lighting is undertaken by gas companies, and that the tender had been prepared with the view of giving the best and most suitable illuminating power for Windsor. Under it, the standards would, at the end of five years, become the property of the Corporation, but not the lanterns and fittings. If the Corporation wished to retain the existing arc lamps, the Company would be willing to provide the 280 single lights for £931 per annum.

The Electrical Installation Company, whose tender was signed by their Chief Engineer (Mr. A. E. Farrow), quoted £18 per annum per 8-ampere flame arc lamp, each of a nominal 2400-candle power, of the type at present erected in the High Street, &c.; the lamps to be lighted one hour after sunset, and extinguished at 11.30 p.m., after which time there would be two lamps of 22 nominal candle power, each to burn until one hour before sunrise. The Company were willing to agree to any desired variation of times provided it did not entail any increase in the actual burning hours. For lighting the side streets they quoted £4 4s. per annum per twin 22 nominal candle power lamp, or, if preferred, £2 5s. per standard per annum for one single 22-candle lamp on each standard. As an alternative, they offered current at a flat-rate of 2d. per unit; the Corporation to provide standards and lamps, and be responsible for renewals and maintenance. On these terms, using an 8-ampere flame arc lamp, the Corporation would, it was stated, obtain 2400 nominal candle power for 1d. per hour; and using Tantalum lamps, 275 nominal candle power for 1d. per hour. The Company were prepared to lend the Council the whole of the street lighting standards, as at present erected, for five years, at an annual rental of £30, or to sell them, either now or at the termination of the lighting contract, for £500, or an extended payment of £106 a year for five years. The Company pointed out that the lighting of the streets of the borough is at present equal to more than 80,000-candle power, though their contract was for only 40,000-candle power. The light is distributed as follows: 29 arc lamps, each of 2400 nominal candle power, in the main streets; one arc lamp of 500 and one of 400 nominal candle power; and 284 pairs of glow lamps in the side streets, each pair of 44 nominal candle power.

The Lighting Committee of the Corporation, who had had the tenders under consideration, recommended that, on the expiration of the present lighting contract, the arc lamps in the main streets should be maintained, at £558 per annum; and that the lamps in the side streets should be lighted by gas, at £931 per annum. The recommendation was embodied in the report of their proceedings which they presented to the Council on Wednesday. A petition had been received in favour of the retention of the arc lamps in the main streets; and this having been read, the Chairman of the Lighting Committee (Mr. Bressey) explained that altogether the Electric Company's tender amounted to £1852 per annum (including £106 per annum for standards) for lighting as at present, compared with £1424 under the existing arrangement. The Company had increased the lighting power beyond the contract; and it was desired that the present standard of illumination should be maintained. The Gas Company's tender amounted to £653 less than that of the Electrical Company. If the Committee's recommendation was adopted, it would mean £65 a year more than under the present contract, *plus* the cost of the arc light standards. He did not think the town would tolerate going back to the single electric lights in the side streets, offered by the Electric Company at £2 5s. each per annum. It was, however, certainly a matter for economy; and he was not prepared to move the adoption of the report. This was consequently done by Mr. Sharpe, who said that if the recommendation was adopted the town would have 31 arc lamps, each of 2400-candle power, in the main streets, and 280 gas-lamps, each of 60-candle power, in the side streets—making a total of 91,200-candle power, or an increase of 12,000-candle power—and for it they would pay £1489. Making the deduction in respect of the 280 gas-standards, worth £1 each, which would become the property of the Corporation at the end of five years, the cost would work out at £1450 per annum. Mr. Bressey moved an amendment to accept the Gas Company's tender for the lighting of the side streets, and to refer back to the Lighting Committee the question of the lighting of the main streets. He said that the enormous amount of light in the main streets was hardly fair to the other portions of the town. If they accepted the whole tender of the Gas Company against the arc lamps, they would save £300 per annum; but he thought they might be able to see some *via media* by which they could arrange differently. Mr. Flint, in seconding the amendment, remarked that they were all agreed as to having gas in the side streets; the question was as to the arc lamps. Mr. Luff said that before the introduction of electricity the cost for the public lighting was £727 per annum, whereas the average for the past eight years had been £1403; so that they had doubled the cost to the ratepayers. Up to eight years ago the lighting cost was 27s. 6d. per head, and since then 34s. 6d. They talked about brilliant lighting and the advantage it was to the town; but the closed shops were the result of the expensive lighting. The wisdom of the Council would be shown by the acceptance of the smaller tender; and even then they would have three times the light in the main streets that there would be in the side streets. Mr. Suckling remarked that if gas were adopted for the main streets there would be ample light, and it would be much better diffused. Alderman Reavell thought the arc lamps were far too brilliant, and unnecessary. Here was an opportunity of effecting economy. Mr. Stoneham said there were two objections to the electric light. It was expensive, and they did not get it, for the lamps were out so often that they were a nuisance. As to having gas in the side streets, it was admitted that there would be more light than there was at the present time.

In the result, Mr. Bressey's amendment was defeated, as was also one to the effect that the tender of the Gas Company for the whole town should be accepted; and the Committee's recommendation for electric light in the main streets and gas in the side streets was adopted by eight votes to three.

GAS EXHIBITION AT CLEETHORPES.

The Cleethorpes Gas Company have been holding a successful exhibition, with some excellently fitted-up rooms, showing the application of the latest style of gas lighting, heating, and cooking apparatus. There were also a number of other good exhibits; and demonstrations were given both afternoon and evening by Mrs. C. F. Pitcher. On the first day of the exhibition, Councillor E. J. Brockway, the Engineer and Secretary to the Gas Company, asked Mrs. Alec Black to declare the exhibition open, and, in doing so, she said she had never seen an exhibition so tastefully and beautifully arranged. Mr. Brockway was warmly congratulated; and he replied that whatever was worth doing was worth doing well, and that was what he had tried to do. The exhibition showed that gas had no rival in economy and adaptabilities.

In the suite of rooms, the drawing-room was fitted with a handsome gas-fire in gold and black; and there were a number of artistic gas pendants and brackets. The lights were turned on and off by the "Norwich" switch arrangement. In the bedroom, the Telephos system of lighting gas was shown; and Mr. Brockway expressed himself as being highly pleased with the arrangement. The kitchen contained a Wilson circulator, its application being shown for supplying hot water to a bath room, kitchen, &c.; and the range fitted was a combination one for both gas and coal.

Messrs. G. Hands and Co., in addition to showing the "Norwich" switch, had an attractive exhibit of inverted burners and gas-fittings. The Welsbach Incandescent Gaslight Company, with their other specialities, displayed their self-intensifying lamps; and the Anti-Vibration Incandescent Lighting Company also had a number of their goods on view. Messrs. Wilsons and Mathieson exhibited a great variety of cookers, as well as their combined cooker and fire. Another useful article to be seen was the Thorp patent discount meter, which was shown by Mr. T. G. Marsh. This is particularly applicable at Cleethorpes, where the Gas Company have decided to allow a discount of 2d. per 1000 cubic feet in respect of gas used in cookers and fires.

Braintree Water Supply.—An inquiry on behalf of the Local Government Board was held at Braintree a few days ago by Mr. M. K. North, respecting an application by the Urban District Council for a loan of £3500 for improvements at the water-works. The Clerk (Mr. H. J. Cunnington), in reply to the Inspector, said the estimated population of the town was now 5800; and the existing loans amounted to £7419. For some years the head of water had been decreasing in the artesian well; and during the summer time it was necessary to pump continuously day and night to keep up the necessary supply. The cost of the continuous pumping was very great. It was now proposed to deepen the well, to put down a suction-gas plant in place of the old steam plant, and to increase the storage capacity. The scheme was calculated to provide an ample supply by ten hours' pumping; and the Council would also, if necessary, be in a position to supply an enlarged area at any time. Mr. Percy Griffith, the Engineer, gave the details of the scheme, which, he said, would provide 360,000 gallons a day, instead of 150,000 gallons, as pumped at present; and a great saving would be effected in the expense.

GAS v. ELECTRICITY FOR ASYLUM LIGHTING.

Competition in Dublin.

At the present time, there is keen competition going on between the Corporation of Dublin and the Alliance and Dublin Consumers' Gas Company for the lighting of the Richmond District Lunatic Asylum, in New Brunswick Street. Early in the year, the Corporation submitted a proposal, through the Secretary of the Lighting Committee (Mr. F. J. Allen) and the City Electrical Engineer (Mr. Mark Ruddle); and quite recently an amended proposition has been sent in. In the former, Mr. Ruddle based his estimate on a comparison between an obsolete method of gas lighting and, to a considerable extent, the most efficient electric lamp on the market. Subsequently, however, he informed the Asylum authorities that his original estimate could be materially reduced by the use of metallic filament lamps throughout, instead of combining them with a certain proportion of carbon lamps, as at first suggested, and still have lighting equal to 35,000-candle power, or 50 per cent. more than the present lighting by means of gas, while the annual cost at the proposed rate (3d. per unit) would be reduced from £1006 to £743. In view of this amended proposition, Mr. F. T. Cotton, the Secretary and Manager to the Gas Company, addressed a letter to the Chief Clerk to the Asylum (Mr. W. J. Murphy), in which he gave him some useful information on the subject of modern gas lighting and its attendant advantages.

Mr. Cotton pointed out, first, that a fair average efficiency for an Osram lamp of so-called 32-candle power, according to practical tests made by electricians themselves, would be 27·5 candles, and that a consumption of 1·3 watts per candle, or 65¼ units per lamp per annum, burning, on an average, five hours per day, at 3d. per unit, would come to 16s. 3¾d., or a total of £978 15s. for 1200 lamps and 33,000-candle power. Consequently, the reduced annual charge of £743 for electricity was £235 15s. lower than the actual cost would really be. He therefore challenged the Lighting Committee to substantiate Mr. Allen's statement in his letter to the effect that the City Electrical Engineer's figures simply "set forth the results of their experience of electricity in other premises in the city." His suggestion that the lighting of the Asylum should be given to the Corporation in order to confer a material advantage on the ratepayers Mr. Cotton regarded as ludicrous, seeing that the electric light undertaking is at present a burden on them, and the expense of the Corporation's proposals would enormously increase the cost of lighting the Asylum at the ratepayers' expense.

With regard to a statement by Mr. Allen that gas lighting had been found unsuitable for a large section of the Asylum premises, Mr. Cotton called attention to the fact that it was decided to light the Cork Lunatic Asylum by incandescent gas; and he has been informed that Dr. FitzGerald, the Resident Medical Superintendent, considers that the Asylum is as well lighted as any, and at less cost. In this case, the Governors made a most exhaustive inquiry, and decided in favour of gas, though the local Electric Light Company offered to renew the electric lamps free of charge. Mr. Cotton is informed that the cost of lighting the Asylum by gas is far below the Gas Company's estimate. In the case of the Richmond Asylum, it is not the Company's intention to fit incandescent gas-burners throughout the building. They have amply provided flat-flame burners for positions in passages and places where it may be considered undesirable to put up a strong incandescent light. Nevertheless, the total lighting power under their scheme will average 72,000 candles.

In the course of his letter, Mr. Allen stated that the Gas Company's offer to supply three times the amount of lighting for half the cost could not be carried out solely by the substitution of incandescent burners for the present flat-flame jets. To this Mr. Cotton replied that the present illuminating power per cubic foot of gas, with incandescent lighting averages from 27 to 30 candles. Mr. Allen further stated that it would be necessary for the Company to reduce the price of gas to carry out their offer, whereby the Corporation would be entitled, under agreement, to a reduction, resulting in a saving to the Corporation on the public lighting of £2000 per annum. Mr. Cotton's comment upon this was that if the Lighting Committee were sincere in authorizing Mr. Allen to make these extraordinary statements, it was remarkable that they should be used as an argument to induce the Asylum authorities to refuse the Company's offer. It certainly could not be reconciled with the statement in the same letter that the authorities should accept the Corporation's proposal in order to help the rates. It appears that several large ratepayers in Dublin are now considering what steps should be taken to compel the Corporation to charge a price for current whereby the electricity undertaking will be able to pay its way, and not be run at the ratepayers' expense. Why, asked Mr. Cotton, should the gas consumer have to pay, through the rates, for his neighbour's electric light? If, however, the Guardians decide to light the Asylum by electric light, the most satisfactory and economical way of doing this would, he said, be by a private installation; and the Gas Company would be prepared to undertake this work, supplying the current at a price per unit to be fixed.

Mr. Cotton did not, in his letter, deal with the important question of the heating, ventilating, and sterilizing effects of gas; but he said he should be pleased to place before the Guardians the most recent technical and scientific information upon the subject, which he felt sure would convince them that gas was in every way more suitable for their purpose than electricity. There was, however, one point he mentioned—viz., that the introduction of electricity would be immediately followed by a large expense in providing either gas-fires or steam-coils for heating the buildings, and an elaborate system of circulating fans for ventilating.

A circular has been issued to the shareholders in the Newcastle and Gateshead Gas Company by the Secretary (Mr. T. Waddom) with reference to the opposition to the Coal Mines (Eight Hours) Bill. It urges that the effect of the passing of the measure would be to "add very materially to the cost of coal, which is at present very high, and would consequently increase the price of gas." Where the shareholders are in sympathy with the opposition to the Bill, the circular invites them to urge their parliamentary representative to oppose it.

MUNICIPAL AND PUBLIC HEALTH EXHIBITION.

The Papers and Conferences.

As was mentioned in the notices of this exhibition which have appeared in the "JOURNAL," arrangements were made for holding, during its continuance, conferences on subjects bearing upon municipal management. They took place daily until yesterday week, when the exhibition closed. We give below abstracts of some of the papers on matters in which our readers are interested.*

Mr. H. G. COALES submitted a paper on

"COALESINE" FUEL FROM REFUSE.

The author first pointed out that what is misnamed "refuse" has a calorific value, and that by being converted into another form might be made of great utility. He set down two main factors in favour of converting refuse into fuel—viz., that crude refuse is a nuisance which might be averted by subjecting it to fire; and that it is a fuel which might be utilized in the production of heat. He then explained the process of preparing "Coalesine" fuel. The crude refuse is first pulverized, and then mixed with tar compounds and pressed into briquettes. After this treatment, the material is mixed with tar as a deodorizer, which increases the value of the fuel and acts as an agglutinate and enricher. The author stated that the amount of tar used increased the calorific value of poor refuse by roughly 100 per cent. This was pressed into the form of briquettes, which could be easily handled and stored. The cost of plant for converting 1000 tons of ashbin refuse per annum into "Coalesine" fuel was given as £2000. The cost of producing "Coalesine" fuel would be about 4s. per ton; and the approximate calorific value was about one-third that of best coal.

Dr. SAMUEL RIDEAL, F.I.C., delivered one of the afternoon lectures, on the

BACTERIOLOGICAL EXAMINATION OF WATERS.

He began by pointing out that it is customary for the bacteriologist to commence his work by counting the total number of organisms in the sample of water under analysis. It is determined on plates at the room temperature (20° to 22° C), using quantities of 0·1 c.c. to 1 c.c. of the sample. He then notes if the colonies are chiefly of the same nature or variable, and also the number of rapidly liquefying and protean (swarming) types present. The old standard, suggested by Dr. Koch, was a maximum of 100 organisms per cubic centimetre; but the number may be increased from various causes. In a water recently examined by the lecturer, the total number of organisms was found to amount to some thousands in the quantity mentioned; but the water was otherwise pure, and showed no other condemnatory signs, either chemical or bacteriological. An examination of the gelatine plates demonstrated chiefly one organism present—a harmless non-liquefying bacillus growing only at the room temperature; and it was found that these organisms were derived from the filter-cloths used in the process for softening the water.

The number of blood-heat organisms is determined on Agar plates, incubated at 37·5° C., and examined after 24 to 48 hours. Dr. Rideal stated that some years ago he drew attention to the ratio of blood-heat to the total number of organisms present in pure waters; and periodical examinations he had made of a London water showed the average to be about 10.

Passing on to deal with special tests, the lecturer explained that the expression "coli organisms" was a generic term, and includes organisms which were not derived from human excrement and very universally distributed. He then went on to deal with bacteria in sewage; and, in conclusion, he said that the Local Government Board having now ceased to control the examinations made of the London water supplies, the matter rested solely in the hands of Dr. Houston (the Director of Medical Examinations to the Metropolitan Water Board) and his colleagues. He considered this state of affairs unsatisfactory, especially when it was remembered that it is impossible for the expert engaged in private and commercial work to undertake the immense labour and expense that would be incurred by attempting to check the results.

Mr. W. J. DIBDIN, F.I.C., F.C.S., prepared a paper (which, in his absence through illness, was read by his son, Mr. R. Aglio Dibdin) on

THE BACTERIOLOGICAL AND MICROSCOPICAL EXAMINATION OF WATER.

The author began by pointing out that bacteria are universally distributed over the surface of the earth, and that their nature and properties in any locality depend upon their environment. They are, however, always associated in Nature with decomposing organic matter. Wherever there is life there is waste finding its way to the earth or to some body of water. This waste undergoes a process of fermentation or decomposition, accompanied, if not entirely caused, by bacteria. A clue is thus afforded to the distribution of bacteria in water. While many types of bacteria may multiply in fairly pure waters, most varieties, especially in any quantity, are found only in connection with the waste organic matter on which they feed. As this is mainly on the surface of the soil, the water draining therefrom is highly charged with bacteria, the numbers and character of which roughly indicate the nature of the organic matter on which they have thrived. Conversely, if the nature of the matter is known, the character of the organisms can be predicted. Bacteriologically, therefore, as well as geologically, waters can be grouped according to their source: (1) Rain, (2) mountain streams, (3) lakes, &c., (4) moorlands, (5) rivers, (6) shallow wells mainly supplied by surface water, (7) deep wells.

Rain water varies with locality, the quantity of dust in the air, &c.,

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* The paper by Mr. Gaster, on "Efficient Illumination and Municipal Requirements," was referred to in the "JOURNAL" last week, p. 363; that by Mr. Dow, on "The Measurement of Light and Illumination," is dealt with in the present issue, page 436.

and is therefore not always free from bacteria. After heavy rains, the water from mountain streams may be sterile; but that from lakes, moorlands, and rivers is variable according to the degree of contamination. If the contamination is from a sewage area, the number and character of the bacteria will be so marked as to indicate the fact. Various factors are constantly at work to determine the ultimate number of bacteria in a sample of water. In the case of a river, sedimentation, rate of flow, temperature, and variable rainfall affect the number of organisms. Storage in reservoirs causes a marked reduction through sedimentation alone; while filtration through sand effects greater improvement. The process of softening is highly advantageous. By its means, in the water supplied by the late New River Company the total number of organisms was reduced by 87 per cent.—from 167 to 27 per c.c.; making this water comparable to that of the Welsh mountain streams at their best, with 26 organisms per cubic centimetre.

The bacteriological examination of water takes some four to five days. For this reason, among others, the author has always held that a searching examination by means of the microscope is far more important, as within an hour of a sample being received a sound conclusion can be formed as to its character. The apparatus is the "micro-filter" which he designed in connection with his investigations on the London water supply for the London County Council in 1895. A litre of water is filtered through hardened filter-paper on which the particular matters are concentrated. These are washed into a tube drawn out to a fine end 2 mm. in diameter. By centrifuging, the whole of the suspended matters in a litre of water can be concentrated in the tube, measured volumetrically, and with a little skill transferred to a microscope glass slide for examination under various lenses. Each particle is carefully scrutinized; and matters generally found in association with sewage are noted. The author thinks it is obvious that such an examination is more useful than the chemical one, which records all substances in terms of carbon, nitrogen, &c., and than the bacteriological examination, which sometimes determines the organisms, but gives no positive information as to the quantity and quality of the matters with which they are associated. Many decomposable matters may be thus detected which perhaps have not decomposed; and their presence demands some explanation as to their source of ingress to the supply. Bacteriology does not detect these substances.

In the author's examination of London water, he classed as objectionable all those samples which contained a comparatively large quantity of *débris*, microscopic eels, decaying matter infested with bacteria, the larger infusoria, epithelium scales, &c. From a long series of tests, it is found possible to interpret the volumetric results obtained with the micro-filter into grains per gallon. So delicate is this process, that he has often been able to turn from his microscope to the telephone and place an engineer on his guard as to the quality of the water within an hour after the receipt of the sample. Such a method is assuredly more useful than any other which gives warning some days after the mischief has been done.

Mr. H. T. WAKELAM, M.Inst.C.E., the County Engineer of Middlesex, read a paper, from which the following are some extracts, on

THE ROADS QUESTION.

The author sent up a paper on "Road Construction, Maintenance, Improvements, and Subsidies" to the annual meeting of the Association of Municipal and County Engineers in London in June, 1906, and pointed out in it that some time previously he had prepared (in connection with his evidence before the Departmental Committee on Heavy Motor-Car Traffic) moderate estimates for re-forming and strengthening the main and district roads of England and Wales to sustain the weight it was then suggested they should carry. The estimates showed that the following expenditures would be necessary for the purpose: On rural main roads, £80,334,560; on rural district roads, £184,607,760; on urban district roads, £22,758,480—total, £287,700,800. The main roads in the urban districts were not dealt with in the figures given; it being assumed that the increased and heavy expenditures during the last decade had probably caused the urban carriageways to be sufficiently strong to carry the weights imposed by the regulations issued by the Local Government Board in connection with heavy motor-car traffic. Taking the latter with the light and fast car traffic of to-day, it has created a great outcry, both in this country and abroad, for better surfaces on all classes of roads.

The last ten years have seen marvellous developments and changes in self-propelled vehicles, and there is no doubt that, with the further increase in mechanical traction, which may reasonably be expected, a still greater request will be made for better carriageways. How to meet this extra traction traffic is not only a problem for the road engineer, but also for those who have charge of the finances of the county, city, borough, and district authorities throughout England and Wales. Apart from the question of a thorough reconstruction of the roads of the country, to which the figures given have reference, an expenditure of something like £50,000,000 would be necessary to resurface the rural main road carriageways of England and Wales with tarred slags or limestones, and a much greater sum if tarred granites or basalts were used.

To obtain reliable information as to the lasting qualities of tarred macadam, the author expended about £2500 last summer in laying experimental surface lengths of different materials treated with tar, &c., along a section of the Bath main road. The section marked out for the experiments was selected to obtain results under exactly the same traffic, atmospheric, wind, and labour conditions, and every factor to secure absolutely fair comparative records of the materials used. The cost of the experiments worked out at about 4s. per square yard, which gives £57,586,560 for the whole area of the rural main roads in England and Wales. The materials spread are now being carefully watched, and the author hopes to be in a position to publish at some future time the notes of his observations in regard to them. The lengths are six in number, and consist of tarred limestone, tarred granite and limestone chippings matrix, tarred granite and limestone, tarred flints and limestone matrix, "tarmac," and a coating of granite.

Considering the large amount of the estimated expenditures previously referred to, the author thought it was useless to take up the time of the meeting with suggestions for road re-formation or re-construction, as the requisite funds for such work could not possibly be forthcoming under the present local financial conditions. It would probably be better, in his opinion, if the meeting considered the more pressing work of road authorities in relation to the dust nuisance. He was appointed by the Association of Municipal and County Engineers to watch the results of the dust trials carried out in May, 1907, under the auspices of the Roads Improvement Association, and was also one of the Judges in the competitions instituted by the latter body, particulars of which have been given in the "JOURNAL."

After the competitions, the Staines road was kept under careful observation by the author, who made notes in regard to the durability and penetrative power of the various tars and compounds spread by the different competitors, and he gave the results in a full table appended to his paper. We take from it the following particulars relating to the use of tar materials: A length of about 200 yards of road was treated by the Gaslight and Coke Company to the depth of ⅝ inch. When inspected on the 30th of May, the south half of the road was loose and picking up, while the north side was wearing well. On the 4th of June, the road was in the same condition. On the 7th, the south half was wearing badly and the north half fairly well. On the 25th, the south half of the road surface was loose. On the 2nd of July, the surface was loose and dust was blowing; and on the 18th, the road was very dusty. The County Council of Middlesex had a length of about 200 yards of road tar painted by hand, and it had just been completed when it was inspected on the 4th of June. A week later, it was wearing well; but on the 25th of June, the road was lifting a little along the centre. On the 2nd of July, it was in better condition over the whole surface; and on the 18th, it was wearing well, with very little dust. A section of road treated with oil tar to the depth of ⅝ inch by the Gaslight and Coke Company was inspected on various dates, with the following results: May 30, very good condition, no dust; June 4, wearing well; June 11, wearing well, turning brown; June 25, wearing well; July 2, centre of road wearing off, but sides fairly well covered; July 18, still wearing fairly well, best section not sanded. One of the best sections of road was treated to the depth of 1 inch with Clare's patent tar compo., which obtained the Association's gold medal. It was inspected at different times from May 30 to July 18, and was found to be wearing well. The author thought much credit was due to the Association and to their Hon. Secretary (Mr. Rees Jeffreys) for their enterprise in carrying out tests which could not be legally undertaken at the expense of a local authority.

The author, in the paper read by him before the Association of Municipal and County Engineers already referred to, stated that in his opinion the best and cheapest solution of the dust nuisance generally, under the existing monetary difficulties, was in the direction of efficient liquid bituminous surface coverings combined with the use of the hardest road materials procurable. With two years' extended knowledge of the subject (and which time has been spent in carefully watching not only his own county work and experiments, but also the work and experiments of others), this opinion is still stronger; and his conviction now is that, as a method to secure relief from the dust nuisance in villages and populous centres alone, at a cost which can be best borne by the existing heavily-rated population of England and Wales, there is nothing to compare with efficient bituminous coverings. They may be used in conjunction with the hardest road materials procurable; and this being so, the author believes that their use can be extended and justified more than other systems of waterproofing or waterproofed roads.

Close of the Exhibition—Thanks of the Organizing Managers.

The exhibition closed last Tuesday; and the Organizing Managers (Messrs. Smith and Bridges) have since issued a circular letter, expressing their hearty appreciation of the support it received from the Press, to which they consider its success was to a large extent due. They explain that their idea in organizing the first Municipal and Public Health Exhibition, which they believe has marked a new departure in municipal life and work, was to provide for the municipal engineers, officials, and councillors an enterprise which they might regard as their own, and in which they might see not only the latest methods and appliances available in every branch, but means and practice in vogue in other municipalities. That this idea was fully appreciated by engineers, surveyors, and others interested, was, the organizers say, borne out by "the keen interest taken in the exhibition by municipal authorities all over the kingdom;" and they have been much gratified by the way in which these have testified to the value and interest of the exhibits themselves, and to the numerous items gathered together in the loan section, notwithstanding the fact that the difficulties of organizing a representative display this year were enormous. Moreover, what is perhaps a more important test of the success of such an undertaking, the exhibitors have, it is stated, expressed themselves as perfectly satisfield with the results of their outlay; and many of them have intimated their willingness to take part in the next venture carried out on similar lines. With these expressions of opinion in mind, therefore, Messrs. Smith and Bridges purpose holding a similar exhibition in 1910, as they believe that one dealing with municipal work held every alternate year is quite sufficient to cover all new appliances and methods which may be introduced, and meet all the requirements of municipal officials. The experience that they have gained in organizing the exhibition just closed has enabled them to discern several features and developments which they think will make the second show vastly more valuable from every point of view. On behalf of the Honorary Advisory Council, they take the opportunity of thanking the various gentlemen who so generously devoted their time to the preparation and delivery of lectures or papers at the conferences held during the exhibition. Interest in these contributions was not by any means confined to those who attended, as is proved by numerous inquiries which have been received for copies. Apart from the fortunate circumstance that the exhibition was opened by so distinguished a visitor from the Colonies as the Lord Mayor of Melbourne (Mr. Henry Weedon), we learn that it was visited by municipal authorities connected with South Africa, New Zealand, Singapore, and other Foreign and Colonial possessions.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Scottish National Exhibition, which is running in Edinburgh this year—I had almost used the word summer—has taken the promoters a long time to get it into shape. Even yet it is far from that state of completeness which would justify much pains being taken by anyone to pay it a visit. When it is finished, which will be a week or two yet, it will be found, from all indications, to be an exhibition on the small side, but with a good selection of exhibits, the bulk of which are distinctly Scotch in character. Of gas exhibits, apart from service installations, there are very few. So far as I can make out, what can be accomplished in the way of lighting by means of coal gas is shown upon only one stand; and appliances for cooking and heating by gas, although in use upon a number of stands, are also shown as exhibits upon only one. For everyone connected with the gas industry the interest in the exhibition will be in the public lighting, which has been already fully described in the columns of the "JOURNAL." It is a magnificent display from the utilitarian, but there is a touch of failure in it from the æsthetic, point of view. The space is splendidly and strikingly lighted; but there is a feeling of want of arrangement of the lamps. The lamps themselves have a lack of uniformity. They are in singles and in threes. Artificial lighting is the most effective illuminating agency we possess; and its use in the exhibition grounds gives the feeling that the effective has been overshadowed by the practical. There is no point at which the visitor can say the view is a spectacularly attractive one.

Seeing that the Gas Commissioners have the public lighting in their hands, it was appropriate that they should have paid a formal visit of inspection on the completion of their work. This event took place on the evening of Monday last. The Commissioners dined together in the Welcome Club, with Lord Provost Gibson in the chair. Sir Robert Cranston, the Chairman of the Executive, announced that the cost of the exhibition buildings had been paid by the money received for season tickets and rents for space; and he anticipated that, if they had good weather, they would have a handsome surplus at the end of the day. Lord Provost Gibson said that he also anticipated a brilliant and enjoyable season. Mr. W. R. Herring stated that the lamps in the main avenue were quite novel. They were the first of the kind which had been installed on a large scale; and they were being employed in the Franco-British Exhibition. They were of 1700-candle power, and gave 2230 candles per hour of light for a pennyworth of gas. The Commissioners had a walk round the grounds and the buildings which are lighted by gas, and were thoroughly satisfied with the efficiency of all the arrangements.

The Lord Provost's Committee of the Edinburgh Town Council on Wednesday considered the draft Provisional Order which is being promoted by the Gas Commissioners; and they agreed to recommend the Town Council to petition against it, for the purpose of preserving the position of the city. One of the proposals in the Order is the reduction of the illuminating power of the gas from a minimum of 20 candles to a minimum of 14 candles; and the Committee consider it desirable that there should be some agreement on this point.

The Gas Committee of the Dundee Town Council met at the gas-works on Wednesday, and agreed to recommend the Council to accept tenders for 65,000 tons of the 80,000 tons of coal required during the year which is now current. In every respect, it was announced, the contracts were satisfactory; and, as compared with the prices paid during the past year, there was a saving, upon the quantity agreed upon, amounting to about £4300. The accepted contracts are distributed among eleven offerers. The average price works out at 1s. 4d. per ton less than last year. In view of the possibility of the price of coal falling below present quotations, the Committee agreed to defer contracting for the balance of 15,000 tons. They anticipate that the accounts for the year will allow of a reduction in the price of gas.

On Thursday, the Dundee Town Council had before them the subject of the regulation of their senior public offices, which came up as a sequel to the recent abstraction of a cash-box from the office of the Gas Treasurer. The proposal put forward by a Special Committee was that the offices of Police and Water Treasurer should be disjoined from the offices of City Chamberlain and Gas Treasurer. Mr. A. W. Stiven has held the combined offices for about eighteen months, at a salary of £800 a year. Treasurer Urquhart moved that the offices be disjoined as proposed, and that the salary of Mr. Stiven, as Police and Water Treasurer, be £800. Mr. Scrymgeour demanded that the report of the Special Committee should be read. This was agreed to. In the report it was stated that the object which the Council had in view in effecting the amalgamation of offices was not only the economy to be effected in staff salaries, but the more efficient working, and particularly the securing of expert skill in the organization and supervision of all the financial offices for which the Council were responsible; and that at the time of Mr. Stiven assuming the duties of Gas Treasurer the office was altogether without effective organization, and the system of book-keeping primitive and wholly insufficient for the large interests involved. There was no actual chief of the staff responsible to the Treasurer for the daily routine of business. Mr. Lindsay was titular Superintendent of the office; but the cashier, the book-keeper, and the clerk in charge of the automatic meters acted quite separately and independently, each one in his own department. There was, as a necessary consequence, an entire absence of the good order and discipline that were indispensable in a public office. Generally no record was made of the quantity of gas actually sold to customers, and consequently no real check on the cash realized therefrom was available, as in ordinary trading concerns. The crudest system prevailed in the automatic meter department. The collectors gave no receipts to consumers; and although index readings were noted in the collection-books, there was no daily check made to ascertain whether the cash received tallied with the gas consumed. No proper entries nor other records were kept of the rebates due to consumers; and it transpired that these were paid over only in the event of being claimed. Another most reprehensible practice fell specially to be noted—that at the time of the annual balance the clerk in charge did not hand over the collections until a new ledger had been opened, and the entries actually made therein. These sums amounted on occasions to over £300. This was done with the knowledge and consent of the cashier. The Committee strongly condemned the utter want of any businesslike system or check in the department. In the handling of moneys the utmost laxity prevailed. According to regulation, the cashier accepted no payments from collectors nor clerks after 4.30 p.m., with the inevitable results—(1) that large sums remained over night in numerous cash-boxes, unchecked and unaccounted for; and (2) that no individual had the custody of, or could be held responsible for, the total cash in the office at the close of any particular day. Mr. Stiven did not make any detailed and thorough investigation into the conduct and working of the department until or about the time when certain irregularities had been discovered by two subordinates, and by them reported to him. Little or nothing had been done towards reorganization (however much might have been intended) until the disappearance of a cash-box on the 26th of October, 1907. Since that date, and following upon the deliberations and recommendations of two former Committees appointed in this matter, an improved system of book-keeping and checking had been adopted, which would come into operation at the beginning of the financial year. Meantime, certain changes in the staff and alterations in the methods of working had been carried out, and the Committee were of opinion that the department was in as efficient a condition as was compatible with the present *personnel* of the staff. There need be little surprise that the Town Council, after hearing such a black indictment of the system read, resolved that the offices should be disjoined. Mr. Stiven's salary was fixed at £800 a year. The Special Committee was continued, for the purpose of receiving applications for the Gas Treasurership, and co-operating, in view of the special circumstances, with the new official on the question as to which members of the present staff should be dismissed.

The Gas Committee of the Hamilton Town Council reported this week that, in view of the small quantity of cannel coal offered for the ensuing year, they agreed to inspect the enriching plant in the Airdrie and Coatbridge Gas-Works, and that, having done so, they were impressed by the ease and simplicity of working the enriching process, and were unanimously of opinion that a great saving would be effected if that process were adopted, as compared with purchasing cannel coal at its present enhanced price. According to the information they received, one-half to three-quarters of a gallon of benzol would be required to enrich a ton of splint coal sufficiently. If a gallon of benzol were to cost 8d., the total cost would be £600; whereas the 11,700 tons of the local cannel offered would cost £1752 more than splint, as the average price was 3s. above that of splint. Allowing £120 as the cost of the plant, and £80 for connections and alterations of the building, there would be a net probable saving of £952 on the year's working. The Committee recommended that the offer of Messrs. Biggs, Wall, and Co., to supply the plant for £65 be accepted, and that a boiler be purchased, at a cost of about £20. The Committee's recommendation was adopted.

As a further step in the slow negotiations between the Corporation of Lanark and the Lanark Gas Consumers' Company, Limited, relative to a contemplated transfer of the undertaking of the Company, it was reported to the Town Council on Monday that at a meeting of the Special Committee on the gas-works on April 27 a letter was read from the Secretary to the Company asking to be favoured with a perusal of the memorial to Counsel, and the opinion of Mr. John Wilson, K.C., thereon; and that the Committee, seeing that the import of the opinion had been communicated to the Company, declined to allow a perusal of it. The Council homologated the action of the Committee.

The thirty-ninth annual meeting of the Buckie Gaslight Company, Limited, was held on Saturday last, when the Directors reported that, after making allowance for depreciation on buildings and plant on a scale similar to the previous year, the profit for the year amounted to £351. They recommended a dividend of 7½ per cent., which would absorb £149, and that the balance be carried to profit and loss account. The increase in the consumption of gas continues, and the Directors foresee that in the course of another year or two an enlargement of the works will require to be made to enable them to cope with the increasing demand. They have under consideration the price of gas; and hope to be able to announce a reduction when the coal contracts for the year are arranged. The report was adopted.

In the Wishaw Town Council on Monday, Provost Thomson, in terms of a recommendation by the Gas Committee, moved that they place £300 towards a depreciation or reserve fund for the current year. His reason for asking that this should be done was the extra demand for renewals and repairs to such items as gas-cookers, which did not have a life so long as that of their sinking fund. Another reason he had was that they were charging a higher rate for gas supplied through prepayment meters, and that this extra revenue should not go into their ordinary revenue, but be placed apart. The Committee's recommendation was approved by seven votes to four.

Tiverton Gas Supply.—At a meeting of the Tiverton Town Council on Monday last week, Mr. J. Thorne, the Chairman of the Lighting Committee, presented a report on the gas undertaking for the past financial year. The gross profit was £2618, compared with £2502 in 1906-7. The repayment of loans and interest amounted to £2232; so that there was a net balance of £386 in hand, though the price of gas had been reduced by 2d. per 1000 cubic feet. The progress of the undertaking was very gratifying; the make of gas having risen from 30 million cubic feet in 1904-5 to 41 millions in the year lately closed. Between March 1 and April 30, no fewer than 47 new customers were supplied with gas, 24 of whom also had stoves. In view of the large amount to be expended on the works, the Committee did not think it wise to make any further alteration in the price of gas at present. The report was adopted. At the same meeting, a contract with Messrs. Willey and Co., Limited, for the extension of the gas-works was sealed; and the tender of Mr. S. Manning, a local contractor, was accepted for the foundations for the new gasholder, and for the excavating required for other plant—the firm whose contract for the foundations was accepted at a previous meeting having since withdrawn their offer.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, *May* 16.

The market has assumed a quiet tone, and last week's prices are no longer obtainable. Home demand has dropped off, and, immediate export orders having been covered, buyers have become indifferent. The closing quotations are, consequently, £12 5s. per ton f.o.b. Hull, £12 7s. 6d. to £12 8s. 9d. per ton f.o.b. Liverpool, and £12 10s. per ton f.o.b. Leith. The forward position does not attract attention, and no important business has transpired. The quotations for July-December are £12 5s. to £12 7s. 6d. per ton f.o.b., according to port; but these prices are not obtainable.

Nitrate of Soda.

This article is also quiet; and the spot quotations are 10s. 1½d. and 10s. 4½d. per cwt. for 95 per cent. and refined qualities respectively.

Tar Products. LONDON, *May* 18.

The markets for tar products are without alteration. Pitch is very quiet; and low prices are reported to have been accepted for next season's delivery. On the Continent, most of the consumers appear to be fully bought for delivery to the end of the year. This is also the case for the South Wales buyers, who will only now consider business for January-June, 1909, delivery. Pitch has been sold on the east coast at 19s. per ton; while London makers have made offers at 20s. for delivery to the end of June. Creosote is quiet. Business has again been transacted in London at 2d. per gallon; while a fair quantity has been done at 2⅛d. In the Midlands, makers are well sold; but in the North, low prices are stated to have been accepted. Benzol 90 per cent. is quiet. London makes are sold at 8d. per gallon. In the North, 7½d. has been accepted for prompt delivery, and 7⅜d. is reported to have been taken for delivery to the end of the year. Benzol 50-90 per cent. is quiet. London manufacturers will accept 7⅜d.; while in the North 7¼d. has been accepted. Toluol has been sold in London at 8d. for prompt delivery. Carbolic acid remains in about the same position. Continental consumers refuse to buy for delivery beyond September, and up to this period decline to offer more than 1s. 6d. to 1s. 6¼d. f.o.b. east coast for 60's. Naphthalene is unchanged; but salts are dull and difficult of sale.

The average values during the week were: Tar, 11s. 6d. to 15s. 6d. *ex* works. Pitch, London, 20s.; east coast, 19s. to 19s. 3d.; west coast, 19s. to 20s. f.a.s. Benzol, 90 per cent., casks included, London 8d., North 7½d.; 50-90 per cent., casks included, London 7⅜d., North 7¼d. Toluol, casks included, London 8d., North 7½d. Crude naphtha, in bulk, London 3¼d. to 3⅜d., North 3d. to 3⅛d.; solvent naphtha, casks included, London 9¾d. to 10d., North 8⅜d. to 9d.; heavy naphtha, casks included, London 10d. to 10¼d., North 9d. to 9¼d. Creosote, in bulk, London 2d. to 2⅛d., North 2d. to 2⅛d. Heavy oils, in bulk, 2⅝d. to 2¾d. Carbolic acid, 60 per cent., casks included, east coast 1s. 6¼d. to 1s. 6¾d., west coast 1s. 5¾d. to 1s. 6d. Naphthalene, £4 10s. to £8 10s.; salts, 30s. to 32s. 6d., packages included and f.o.b. Anthracene, "A" quality, 1¼d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market for this article has been rather easier during the past week; but it is hoped that there will be a better demand towards the end of the month. The principal London Gas Companies still quote £12 12s. 6d. for prompt delivery, and £12 7s. 6d. July-December. In Hull, business has been done at £12 7s. 6d.; while in Liverpool, £12 10s. has been accepted. In Leith, £12 12s. 6d. has been paid for prompt delivery; but though manufacturers are willing to sell at £12 7s. 6d. for July-December, they cannot obtain this figure.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Coal throughout Lancashire still holds its price in every department. House coal is the only section in which there is any weakness, and that is infinitesimal. Smelting furnaces are falling off in their requirements, owing to the unprofitable returns for the raw metal. Gas coal and cannel contracts are being concluded at about last year's terms. Shipping trade is good. The quotations are: House coal, according to quality, from 12s. to 16s. 6d. at the pits, burgy 10s. 6d. to 11s. 4d., slack 7s. 9d. to 10s. 4d., and shipping coal 13s. to 14s. 6d., f.o.t. at the tips.

Scotch Coal Trade.

The market remains unchanged; the shipping being the best side of it, and the home demand for small sorts being the worst. The prices quoted are: Ell 10s. 9d. to 12s. 3d. per ton f.o.b. Glasgow, splint 10s. 9d. to 11s., and steam 10s. 3d. to 10s. 6d. The shipments for the week amounted to 306,484 tons—a decrease of 2963 tons upon the preceding week, but an increase of 5751 tons upon the corresponding week of last year. For the year to date, the total shipments have been 4,510,900 tons—a decrease of 369,598 tons upon the corresponding period of 1907.

Northern Coal Trade.

There is an activity in the northern coal trade, more especially shown in best coals, but extending slowly to other qualities. The production is steady; and it is well taken up in general. Steam coals are brisk. Best Northumbrians are from 14s. to 14s. 3d. per ton f.o.b.; second-class steams from 12s. 3d. to 12s. 9d., and steam smalls from about 6s. 9d. to 7s. 9d. In the gas coal trade, there is a fair amount of briskness for this season of the year—a briskness that is not due so much to the home demand, but to that from abroad. The home consumption is nearly at its lowest; but the exports are heavy, and seem likely to continue so. Durham gas coals are being quoted from about 10s. 9d. to 11s. 6d. per ton f.o.b. for ordinary qualities, with 12s. 3d. to 12s. 6d. for "special Wears." The remaining contracts for certain of the Metropolitan Companies are now being slowly concluded at about 10s. per ton f.o.b. Tenders are being considered for the Newcastle and Gateshead gas supply, and also for the smaller needs of the Darlington Corporation Gas-Works. As far as can be judged, these requirements will be met at a price that may average about 1s. to 1s. 3d. per ton below those of the contracts that will soon expire. Coke is steady; and gas coke varies from about 14s. to 15s. per ton f.o.b. The production of gas coke is now much reduced, so that the stocks are being drawn upon.

Barry Gas-Works Administration.

Some days ago, a meeting of Barry gas-workers, other municipal employees, and local Trade Unionists, was held to discuss the action of the Gas and Water Committee, who, it was alleged, had delegated full power to Mr. T. E. Franklin, the Gas and Water Manager, with respect to appointments. Two resolutions were carried unanimously. The first was, "That this meeting of organized workers of Barry records its protest against the delegation of power to the Gas and Water Engineer by the Gas and Water Department, which it ought to retain in the interests of local government—namely, the granting to the Engineer a free hand as a condition of employment which contains the right to dismiss any one of the employees without the right of appeal to the Committee responsible." The second resolution was one calling upon the department to recognize the principle of promotion according to seniority, where it could be clearly shown that competent men for the vacancies were among the staff. At the subsequent meeting of the Urban District Council, the recommendation of the Gas and Water Committee to delegate power to the Manager to appoint a foreman provoked a lengthy discussion; numerous letters of protest against it being read. It was proposed that the whole matter should be referred back to the Committee; but Mr. M'Cann, the Chairman, declared that Mr. Franklin had been promised a free hand, and the department required help at the present juncture, instead of criticism. Mr. Franklin asked the Council to adhere to their promise to grant him a free hand, in order to promote the success of the department as a commercial undertaking. Eventually the resolution to delegate power to him was accepted by 16 votes to 4; but after more discussion it was agreed only to allow power of recommendation in the selection of a foreman.

Sales of Stocks and Shares.

At the Mart, Tokenhouse Yard, last Tuesday, Messrs. A. & W. Richards placed some new issues of gas and water capital, by order of Directors. The first lots consisted of £5000 of 5 per cent. ordinary stock and £2500 of 4 per cent. perpetual debenture stock of the South Essex Water Company. The former ranked for a maximum dividend at the rate named; and 4¼ per cent., free of income-tax, has been paid on similar stock for the past two years. It was all sold at £106 per £100, *cum div.* as from the 1st prox. The 4 per cent. debenture stock fetched from £109 to £110 per £100. The next lots consisted of additional ordinary 7 per cent. stock and 4 per cent. perpetual debenture stock of the Felixstowe Gas Company. The former was sold at from £135 to £136 per £100, and the latter at par—in both cases with dividend and interest as from the 1st prox. An issue of £3000 of new ordinary stock and £2000 of 4 per cent. perpetual debenture stock of the Great Yarmouth Water Company was next offered. The former ranked for a maximum dividend of 7 per cent. per annum, though only 4 per cent. has been paid for some few years on similar stock; and it was all sold at from £93 to £98 per £100. The latter fetched from £101 10s. to £104 10s. per £100. The last new issue was some additional ordinary "C" stock of the Northfleet and Greenhithe Gas Company, Limited, ranking for a standard dividend of 7 per cent. per annum, subject to the sliding-scale, equally with the existing "C" stock, the dividends on which for the past four years have been at the rate of 6 per cent. It was sold at par. On the same occasion, Messrs. Richards sold for a private owner some 3½ per cent. additional preference "B" stock of the same Company, carrying dividend as from the 1st of January last, for £69 per £100. At a recent local sale by auction, 100 new £10 shares in the Emsworth Gas Company, entitled to 7 per cent. dividend, subject to the sliding-scale, realized from £12 10s. to £12 12s. 6d. each. Messrs. King, Adkin, and Bowen recently offered for sale at Abingdon 100 "B" £12 10s. shares in the Abingdon Gas Company; being part of a new issue. Eight of them realized £20 5s. apiece, and the remainder £20 each. For the past four years, the dividend on the Company's "B" shares has been 9½ per cent. per annum.

Birmingham Gas Profits for the Past Year.—At the close of the meeting of the Gas Committee of the Birmingham Corporation on Monday last week, the Chairman (Sir Hallewell Rogers) stated that the working of the gas undertaking in the past financial year had been very favourable, and that the sum to be devoted to the relief of the rates would not be less than it was last year—viz., £57,000.

New Issues of Gas and Water Capital.—As readers may have noticed from our advertisement columns, Messrs. A. & W. Richards will offer for sale, at the Mart, Tokenhouse Yard, E.C., on Wednesday, the 27th inst., several new issues of gas and water capital, under instructions from Directors. They consist of 200 £10 ordinary shares and 400 6 per cent. preference shares of the same nominal value in the Barking Gas Company; 400 additional ordinary £10 shares and £1000 of 4 per cent. perpetual debenture stock of the Lowestoft Water and Gas Company; £5000 of additional consolidated ordinary stock of the Maidenhead Gas Company; and 300 £10 "B" shares of the Tendring Hundred Water-Works Company. On the same occasion, they will submit for competition, by direction of executors, £1030 of consolidated ordinary stock of the Chigwell, Loughton, and Woodford Gas Company.

Tar Painting of Roads.—The Borough Surveyor of Burton-upon-Trent (Mr. G. T. Lynam) has commenced an experiment in tar-painting in Derby Road, with a view to mitigating the dust nuisance caused by motor-cars. A portion of the roadway has been treated with a thin layer of hot tar, covered with red sand.

Additional Capital for the Harrow and Stanmore Gas Company.—As already intimated in the "JOURNAL," the Harrow and Stanmore Gas Company are inviting tenders for an issue of 280 "C" £10 shares, (7 per cent.), at a minimum price of £14 each. The latest time for receiving offers is 12 o'clock at noon on Thursday next.

Dispute as to a Leaky Reservoir.—A special meeting of the Wharfedale Rural District Council was held last Friday, to hear the report of a Committee appointed to settle a long-standing dispute regarding the Menston reservoir. Nearly two years ago, it was found that the reservoir, which is to serve the township, was leaking; and after negotiation with the Contractor, the Council decided to themselves do the necessary work of repair, which cost £470. The Contractor then claimed £3400 for damages and extra work. When the case came before the Official Referee in London, he withdrew his claim, and agreed to pay for the repair of the reservoir, and forfeit the retention-money of £1100, and also a bond of £500 into which he had entered.

Stafford Water Supply.—Last year's income of the Stafford Water-Works, £6188, was the highest yet attained, being £255 in excess of that of the preceding twelve months. The expenditure (£2211) was £217 more, so that the increase of gross profit is only £38. After making the necessary provision for sinking fund, interest, and income-tax, and setting aside £940 for depreciation and £550 for reserve, there remains a balance of £652, of which it is proposed that £600 shall be transferred to the district fund as in past years, and the balance of £52 carried forward. The quantity of water raised during the year was 221½ million gallons, equal to 23·73 gallons per head per day for an estimated population of 25,000. These figures show increases of 6¼ million gallons and 0·61 gallon respectively.

Death of a Huddersfield Gas Stoker.—An inquest was held some days ago on the body of Charles Fitton, a gas stoker, who succumbed to injuries sustained by scalds and burns at the Huddersfield Corporation Gas-Works. Mr. W. Hudson (Deputy-Town Clerk) represented the Corporation, and there were present Mr. T. C. Butler (the Factory Inspector), Mr. E. A. Harman (the Gas Engineer), and Mr. W. Wright, who appeared for the widow. The evidence went to show that while deceased was at work, a strong blast of flame came from a furnace and severely burnt him. The outrush was due to water being thrown from above, to remove a supposed obstruction. The water was thrown by a retort-house foreman named Brook, who said he was unaware that there was anyone below at the time. The Jury found that the deceased sustained his injuries accidentally.

Metropolitan Water Board.—At the meeting of the Board on the 8th inst., it was decided, on the recommendation of the Works and Stores Committee, to raise, subject to the sanction of the Local Government Board, a loan of £70,368 for the completion of the Staines reservoirs communication works. On the same occasion, a return was presented giving details, in the usual form, in regard to the supply of water. It showed that the average daily supply was 205,147,000 gallons, and that the number of houses supplied was 1,076,111; the estimated population being 6,976,793. The mean supply per head per day was 29·4 gallons; the figure for the corresponding month of last year being 30·1 gallons. At the end of the month 6735 million gallons of water were in store in impounding reservoirs, compared with 8583 millions at the end of March, 1907. The number of additional supplies was 1270, and the length of mains laid was 8937 yards.

Cockermouth Gas Supply.—At the meeting of the Cockermouth Urban District Council last Wednesday, the minutes presented by the Gas Committee contained the accounts relating to the working of the undertaking in the twelve months ending the 31st of March. The gross profits were shown to be £1151. Deducting from this amount the interest on loans and the instalment of debt repaid, the net profits were £160; and this sum increased the working balance to £2928. After meeting the cost of adding a new and additional lift to the large gasholder, the cost of which was £679, the balance was reduced to £2249. The report of Mr. A. F. Young, the Gas Manager, showed that the receipts for gas had increased by £148, which proved the wisdom of the policy of the Council in reducing the price. The gas-works were stated to be in a sound condition; for although the loans amounted to £14,880, the property as an investment was easily worth double this amount, and besides there was in actual cash a sum available of more than £3000. Mr. Fleming moved the confirmation of the minutes; remarking that, considering the high price of coal, the Council had had a good year. The results spoke well for Mr. Young's management. The minutes were passed.

Portsmouth Water Company.—The Directors of this Company report that the available balance on the profit and loss account for the half year ending the 31st of March is £25,778, out of which they recommend the payment of the full statutory dividends. This, after deductions for void houses, &c., will leave a balance of about £6881 to be carried forward. During the half year, 4239 yards of additional service mains were laid; making a total of about 63½ miles of trunk mains and 158½ miles of service mains. The number of additional services connected with the mains was 466; making the total number of premises now under constant supply by the Company in all the districts 48,458. The quantity of water pumped from Havant and Bedhampton during the six months was 1,405,720,884 gallons, or an average daily supply for all purposes of 7,681,535 gallons; being an increase of 52,064 gallons daily compared with the corresponding period of last year. Exclusive of all supplies by meter, the quantity furnished for domestic use was equal to an average of about 24·57 gallons per day per head of the population, compared with 23·95 gallons in the corresponding period of last year. The number of fire-hydrants now fixed in the Company's districts is 3869. The engines, boilers, reservoirs, and works are reported by the Chief Resident Engineer (Mr. Herbert Ashley, M.Inst.C.E.) to be in good order. The works in connection with the filtration scheme and the new service reservoirs are proceeding satisfactorily.

Gas Profits at Rochdale.—At a recent meeting of the Rochdale Town Council in committee, it was decided to take an additional £1000 from the gas-works profits—making £10,000 for relief of the rates this year. But there will still be £997 to go to the reserve, which will stand at £9891.

More Gas-Stoves for Southport.—Last week a Local Government Board inquiry was held at Southport regarding an application by the Corporation to borrow £5000 for the purchase of gas-stoves. It was stated that the town had now a population of 53,000, and an assessable value of £380,655. A sum of £26,000 had previously been borrowed for the purchase of gas-cookers. There are at present 15,900 gas consumers; and 805 stoves were fixed last year.

Gas Profits at Heywood.—The estimates of the Heywood Corporation Finance Committee, which involve an increase of 4d. in the borough rates, were adopted last week by the Town Council. The increase would have been larger, but for the taking of £800 from the Gas Department's profits in aid of the rates; and opposition was raised to the principle of using the profits from gas to defray the expenditure of other branches. A proposal to refer this recommendation back was, however, defeated.

Sequel to a Gas Poisoning Case.—In the early part of last month, at West Gorton, Manchester, a married couple named Sellers were discovered in bed apparently dead; but subsequently the woman recovered. It was found that a gas-pipe had been introduced into the bed, the sheets of which were pinned down; and the conclusion of the police was that the pair had agreed to die together. Consequently the woman was charged before the City Justices last week, on suspicion with having caused the death of her husband and with attempting to commit suicide. A remand was ordered.

A Borough Council's Dangerous Economy.—According to the "Daily Express," an attempt by the Paddington Borough Council to save £700 by turning out the street-lamps at midnight has failed. The Council tried to economize by leaving in darkness the West End thoroughfares they control. Complaints from indignant ratepayers have, however, compelled them to grant an extension of the lighting limit. Among the other complaints received from residents were the following: (1) Burglars were aided by the darkness. (2) Pickpockets awaited Paddington people who were groping their way home. (3) The difficulty of running for a doctor in the night was greatly increased. The Council, who control 4000 street-lamps from the Marble Arch to Kensington Palace, were moved by these petitions, and have rescinded their order.

Fatality at Wakefield Gas-Works.—At Wakefield on the 8th inst., Mr. Maitland held an inquiry into the circumstances attending the death of a lad named William Dargan (17), who fell from a roof at the Wakefield Gas-Works, where an extension of a retort-house is in progress. On Wednesday the lad had been assisting in raising some scantlings on to a scaffold 50 feet high, and a few minutes later was seen falling. He sustained a fractured spine, and died later at the Clayton Hospital. There was a guard on the front of the scaffold, but not at the end; and it was pointed out that had there been the latter it would have interfered with the work of raising the materials for the roof. The Jury returned a verdict of "Accidental death," but added that they thought there ought to have been more guards. The Coroner said he disagreed with the verdict.

Stourbridge Gas Undertaking.—At the Stourbridge Town Hall last Friday, Mr. F. H. Tulloch, M.Inst.C.E., an Inspector of the Local Government Board, held an inquiry into an application by the Stourbridge Urban District Council for permission to borrow £6000 for extensions in connection with the gas undertaking. The Clerk (Mr. W. W. Goddard) said that under their Act of 1891 the town had almost unlimited borrowing powers. The amount which had been raised in connection with the gas-works was £133,517; but their present liabilities were only £101,373. The Gas Engineer and Manager (Mr. C. H. Webb) gave evidence as to the increase in the make of gas from 95 million cubic feet in 1895 to 212 millions last year. The money now proposed to be borrowed was required for extensions to mains, a new governor, and a repairing-shop for gas-cookers. No opposition was offered; and the Inspector closed the inquiry, and afterwards visited the works.

Road-Tarring at Ilkley.—We learn from a local paper that the Ilkley Urban District Council are about, with the permission of the County Council, to treat a portion of the Ilkley and Otley main road with a preparation called "Tarvia." The surface of the road is first prepared, and then coated about an inch thick with the material named, which is a mixture of tar, chippings, and other ingredients; the metal being placed on the top, and then the whole rolled and squeezed into a solid mass. The preparation the Council are now using in the town is tar macadam, which will be 6 inches thick in the centre and about 4½ inches thick at the sides. It is put down in three layers—the bottom one comprising 2¾ inches of metal, the next 1¼ inches, and the top one about ½ inch, which, as in the case of the "Tarvia," has to undergo compression into a solid mass. With a view to allaying the dust in their district, the Burley Council have for some time been "floating" the main road with tar, which, it is stated, has been fairly successful.

The Ure Valley Water Scheme of the Leeds Corporation.—Steady progress is being made with various works in connection with the new water scheme of the Leeds Corporation in the Ure Valley, and last Friday the Water Committee decided, subject to the approval of the City Council, to let the contract for the construction of the Leighton reservoir to Messrs. H. Arnold and Sons, of Doncaster and Leeds. The price of the contract is £437,182. The reservoir, which is the first of three to be built over an extended period, has a water area of 105 acres. It will hold 1136 million gallons—the depth of water being 105 feet. The highest portion of the bank will be 112 feet above the level of the stream. The reservoir will be connected with Swinsty, in the Washburn Valley, by means of a 33-inch pipe-line, 22 miles long, and a tunnel 2¾ miles in length, which is practically completed. The laying of the first section of the pipe-line has also been finished; and at the meeting of the Committee on Friday it was resolved to recommend that the remaining section shall be carried out by the Contractors hitherto engaged—Messrs. A. Braithwaite and Co., of Leeds.

Gas Profits at Longton.—Last year the Longton Gas Committee voted £2500 to the district fund account, and this year the amount has been increased to £3000. The extra £500, it is pointed out, has gone a long way towards helping the Finance Committee to place the borough fund on so favourable a basis as it now stands.

Increased Profit at St. Helens.—The profits on the St. Helens gas undertaking for the past twelve months amount to £9500, which is an increase of £1300 on the previous year, notwithstanding the increased price of coal. The Gas Committee recommend that £5000 of the profits be devoted to the borough fund for the relief of the rates.

Rhyl's Municipal Undertakings.—On the past year's working of the Rhyl electricity undertaking there was a loss of £814, against an estimated loss of £1100. The net indebtedness on the concern was £3051; and in addition to this amount, the ratepayers have in four years paid £2985. The total loss on the water undertaking up to date is £5496, including a loss of £407 last year. There was a profit on the gas-works during the year of £1731. The total loss on the working of the three concerns during the past five years has amounted to £1453. It is estimated that for the current year the loss on the electricity undertaking will be £831; and on the water-works, £279.

The Increasing Use of Gas-Stoves is having a strange result, beyond the crippling of the chimney sweep's occupation already noted. It seems that the system introduced into the Borough of Southwark for the disposal of house refuse, &c., was formerly by a sort of mincing process and the sale of the minced refuse to farmers as a cheap dressing for their land. Previous to October, 1906, the house refuse was taken to the country depot, screened, and sorted; the ashes and breeze being sold to brickmakers, and the waste material being partly burned and the remainder disposed of in various ways. Owing, however, to the increased use of gas-cooking stoves during the last few years, it has now been found that the nature of the refuse has changed, and that it does not produce ashes and breeze in sufficient quantity to pay for hand screening.

Mr. Moon's Resignation at Middleton.—At the last monthly meeting of the Middleton Town Council, Mr. Parker, in moving the adoption of the Gas Committee minutes, referred to the resignation of the Gas Manager, Mr. J. Carter Moon, as recently recorded in the "JOURNAL." He said he was rather afraid Mr. Moon had been a victim to his own zeal for the success of the gas-works. His health was failing; and he was sure the members would wish him restored health in his new position in Vancouver, and that he would have prosperity. Alderman Schofield, in seconding, said that, owing to Mr. Moon, the gas-works were in an infinitely better state than ever before. He had done his work unostentatiously, and was always at it. In consequence, he had suffered in his health; and he was going to Vancouver partly for the voyage. They wished Mr. Moon better health; and he was confident they would hear more about him in the gas profession. The profits on the department for the past year amounted to £2435. There had not been a balance-sheet like this for a long time.

A Test Declined at Newport (Mon.).—At their meeting last week, the Newport (Mon.) Town Council had before them a letter from the Gas Company in reply to a communication from the Corporation requesting the Company to discontinue the lighting of the gas-lamps in certain streets, as the Corporation had decided to light these roads in future by 27 Osram electric lamps. The Company's letter urged that gas was better and more economical; and invited the Corporation to take part in a trial between the rival lights before independent lighting experts. The Corporation decided to proceed with their scheme to light the streets with electricity.

Gas Profits and the Rates at Bury.—Subject to audit, the balance-sheet of the Bury Corporation gas undertaking for the past year shows a profit of £6258. This is considerably less than in the previous year, owing to the fact that the coal account was over £3000 more. When this statement came before the Council, Alderman Ashworth remarked that some years ago they came to a decision that it was not proper to tax small gas users for the benefit of the large ratepayers, by making a big profit on the sale of gas. They seemed, however, to be getting back to the old position, and into a state of things which would require another attack on the policy adopted by the Gas Committee. Alderman Battersby said he did not altogether agree with this, and asked the members of the Council to look at what they had to face. They had a big precept of the water account to meet, because the water-works did not pay. This deficit had to be met out of the rates; and the ratepayers would have to make up the whole of the deficiency, if there were no benefits from any of the other concerns. In addition to this, they would have to meet a big expenditure on the repairing of the streets; and unless some relief was afforded from the profit-making concerns, they would have to increase the rates by something like 6d. in the pound.

Monte Video Gas Company, Limited.—The report of the Directors for the year 1907 shows that the profit is £34,677. Adding interest and discount £1301, profit on exchange £557, Directors' fees waived £280, and the balance brought forward (£10,937), the total is £47,752. After providing for debenture interest, income-tax, bad and doubtful debts and depreciation, reserving £1000 for renewals, &c., and adding £4240 to the reserve account and £5000 to the contingency account, the balance at the credit of the profit and loss account is £30,278. An interim dividend was paid in November, and the Board now recommend a further amount of 8s. per share, less tax; making together a dividend of 3½ per cent. for the year. This will absorb £18,967, and leave £11,311 to be carried forward. The balance at the credit of the reserve account is increased to £28,000, the contingency account now stands at £18,763, and the insurance fund remains at £12,500. During the year there were satisfactory increases in the number of consumers and in the quantity of gas sold; and the Directors report expansion in every department of the Company's business. Notwithstanding the greater cost of coal and the heavier expenditure for wages due to the shorter hours worked by the employees, the revenue account shows a profit balance higher by £9702 compared with that for the year 1906.

YOU SIMPLY UNDO

FOUR VERTICAL TIE-RODS

And your "NEW CENTURY" EUREKA COOKERS come ENTIRELY APART

THIS IS HOW we sent out the FIRST "New Century" SIX YEARS AGO

THIS IS HOW we have sent them all out EVER SINCE

JOHN WRIGHT & CO.,
Aston, Birmingham.

The Electrical Exhibition to be held in Manchester next October ill cover an area of over 100,000 square feet.

The Parkinson Stove Company, Limited, have appointed Mr. E. J. Rimer as their representative for Scotland and the North of England.

During the evening service last Sunday week, the electric light failed in St. Luke's Church, Torquay; and as gas was not available, candles had to be lit.

The general district rate at Burslem is to be 4d. in the pound less than was the case last year, owing to the fact that the Gas Committee have contributed out of the profits £4500, as compared with £1500 on the previous occasion.

At the meeting of the London County Council last Tuesday, the estimates submitted by the Finance Committee of £4255 and £8720, the estimated expenditure in connection with gas and meter testing for the current financial year, were agreed to.

The net profit on the working of the gas undertaking of the New Mills Urban Council during the past financial year was £584 more than for the year 1906-7, though the price of gas was reduced, the cost of coal was £320 more, and there was a loss of £200 in revenue owing to the abolition of gas-cooker rents.

At the Lambeth Police Court on the 9th inst., John Brazill (16) and William Beeden (13), charged at a previous sitting with being concerned in stealing a quantity of gas-fittings from an unoccupied house in Camden Grove North, Peckham, were again brought up. Beeden was sent to Feltham Industrial School for three years, and the other boy was released under the Offenders' Probation Act.

The Richmond Gas Stove and Meter Company, Limited, have lately co-operated with the St. Ives (Cornwall) Corporation Gas Department in enlightening the inhabitants on the advantages of gas for cooking and heating purposes. They organized a very attractive display of stoves in the Public Hall, and engaged Miss Florence Surridge to give cookery demonstrations by their aid. On the closing day, she prepared a plain dinner with gas supplied through a prepayment meter, which showed the total quantity of gas used. The lectures were attended by large audiences; and the exhibition was in every way a success.

The Richmond Gas Stove and Meter Company, Limited, have recently held successful gas exhibitions in conjunction with the gas authorities at Maidstone, Cleckheaton, Bridlington, Stockport, Saltburn, and Douglas; and an energetic canvass has been carried out in connection with the exhibition in each instance.

An exhibition of gas-cookers, &c., by the Richmond Gas Stove and Meter Company, Limited, was held last week in Trinity Hall, Marple, under the auspices of the Marple Urban District Council. It was opened on the 11th inst. by Dr. G. H. Bailey (the Vice-Chairman of the Council), who gave an interesting account of the origin and progress of the gas-works, which were started by a private individual in 1852 for the supply of his own house and business premises. In 1865 they passed into the hands of the Marple Gas Company, and some twenty years later were acquired by the Local Board. Dr. Bailey was followed by the Richmond Company's representative (Mr. Brown), who gave a lecture on the use of gas for cooking, &c.

Considerable damage was done last Thursday at Lemington by the bursting of a 30-inch water-main; traffic on the North-Eastern Railway between Lemington and Newburn being stopped for some time in consequence. The fracture occurred at a point near a colliery, where the ground is of a very soft character; being composed for the most part of sand and ashes. It is the third time within a month that a main has burst in this neighbourhood; and the theory is advanced that the breakages are caused by the shifting of the ground towards the river, which tends to open the joints. A short while ago a new length of piping had to be let in at one place, owing to the ground having slipped away, and thereby caused damage to the main.

"Unlike some other nitrate concerns," says the "Pall Mall Gazette," "the Anglo Chilian Company fared very well during 1907. Trading and other profits advanced from £129,262 to £172,346; and after providing for administration expenses, income-tax, and the service of the mortgage bonds, there is a balance of £127,484, against £84,620. An addition of £25,000 is made to reserve, and £10,800 is appropriated towards writing down investments to market values. The balance then available is £90,020, against £49,620 a year ago. A final dividend of 10s. per share is to be paid, making 15 per cent. for the year; whereas the distribution for 1906 was only 10 per cent. The carry-forward is more than doubled at £25,391." The Company have adopted oil instead of coal as fuel, it is stated with satisfactory results.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 418.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Apl. 10	10	Alliance & Dublin 10 p.c.	18¾—19¾	..	5 2 7
268,324	10	,,	7	Do. 7 p.c.	13—14	..	5 0 0
310,000	Stk.	Jan. 16	4	Do. 4 p.c. Deb.	100—103	..	3 17 8
200,000	5	Oct. 30	6¼†	Bombay, Ltd.	6¼—6⅝	..	4 16 4
40,000	5	,,	6¼†	Do. New, £4 paid	4⅞—5	..	5 4 0
50,000	10	Feb. 27	14	Bourne-mouth Gas and Water	10 p.c.	27—28	.. 5 0 0
					B 7 p.c.	16½—16⅝	.. 4 3 7
					Pref. 6 p.c.	14—15	.. 4 0 0
51,810	10	,,	7				
53,200	10	,,	6				
380,000	Stk.	,,	12½	Brentford Consolidated		240—245	—1 5 2 1
300,000	,,	,,	9¾	Do. New		180—185	.. 5 2 8
50,000	,,	,,	5	Do. 5 p.c. Pref.		118—123	.. 4 1 4
206,250	,,	Dec. 13	4	Do. 4 p.c. Deb.		100—105	.. 3 16 2
220,000	Stk.	Mch. 12	11½	Brighton & Hove Orig.		202—207	.. 5 8 8
246,320	,,	,,	8¼	Do. A. Ord. Stk.		152—157	.. 5 5 1
460,000	20	Mch. 27	10	British		41½—42½	.. 4 14 1
104,000	Stk.	Feb. 13	6	Bromley, Ord. 5 p.c.		116—119	.. 5 0 10
165,700	,,	,,	4¾	Do. do. 3½ p.c.		86—89	.. 5 1 2
500,000	10	May 14	7	Buenos Ayres (New) Ltd.		11—11⅛*	.. 6 1 9
250,000	Stk.	Dec. 13	4	Do. 4 p.c. Deb.		93—95	.. 4 4 3
150,000	20	Mch. 12	7½	Cagliari, Ltd.		25—26	.. 5 11 6
100,000	10	—	—	Cape Town & Dis., Ltd.		4—6	.. —
100,000	10	Apl. 26	4½	Do. 4½ p.c Pref.		7—9	.. 5 0 0
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.		46—48	.. 6 5 0
103,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.		92—94	.. 4 15 9
157,150	Stk.	Feb. 27	5	Chester 5 p.c. Ord.		111—113	+5½ 4 8 6
1,493,280	Stk.	Mch. 12	5⅛	Commercial 4 p.c Stk.		104—109	.. 4 15 5
560,000	,,	,,	5	Do. 3½ p.c. do.		100—105	.. 4 15 3
475,000	,,	Dec. 13	3	Do. 3½ p.c. Deb. Stk.		82—84	.. 3 11 5
800,000	Stk.	,,	6½	Continental Union, Ltd.		115—120	.. 5 8 4
200,000	,,	,,	7	Do. 7 p.c. Pref.		140—145	.. 4 16 7
460,170	Stk.	—	5½	Derby Con. Stk.		122—123	.. 4 9 5
55,000	,,	—	4	Do. Deb. Stk.		103—105	.. 3 16 2
148,995	,,	Mch. 31	5	East Hull 5 p.c. Ord.		100—103	.. 4 17 1
486,090	10	Jan. 30	12	European, Ltd.		23—24	.. 5 0 0
354,060	10	,,	12	Do. £7 10s. paid		16½—17½	.. 5 2 10
15,182,590	Stk.	Feb. 13	4⅛	Gaslight and Coke	4 p.c. Ord.	94½—95½	.. 4 12 1
2,600,000	,,	,,	3½		3½ p.c. max.	87—90	.. 3 17 9
3,799,735	,,	,,	4		4 p.c. Con. Pref.	106—109	.. 3 13 5
4,193,975	,,	Dec. 13	3		3 p.c. Con. Deb.	83—85	.. 3 10 7
258,740	Stk.	Mch. 12	5	Hastings & St. L. 3½ p.c.		93—98	.. 5 2 0
82,500	,,	,,	6½	Do. do. 5 p.c.		112—115	.. 5 13 1
70,000	10	Apl. 29	11	Hongkong & China, Ltd.		18¾—19¾	.. 5 12 10
4,940,000	Stk.	May 14	8	Imperial Continental		175—177*	.. 4 10 5
473,600	Stk.	Feb. 13	3½	Do. 3½ p.c. Deb. Red.		93—95	.. 3 13 8
195,242	Stk.	Mch. 12	6	Lea Bridge Ord. 5 p.c.		113—118	.. 5 1 8
561,000	Stk.	Feb. 27	10	Liverpool United A		227—229	.. 4 7 4
718,100	,,	,,	7	Do. B		163—165	+1 4 4 10
306,083	,,	Dec. 30	4	Do. Deb. Stk.		106—108	.. 3 14 1
152,736	Stk.	Feb. 13	7⅛	Maidstone 5 p.c.		136—141	.. 5 8 2
75,000	5	Nov. 28	5	Malta & Medn., Ltd.		4¼—4⅝	.. 5 5 3
560,000	100	Apl. 1	5	Met. of 5 p.c. Deb.		100—102	.. 4 18 0
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.		99—101	.. 4 9 1
541,920	20	Nov. 14	3½	Monte Video, Ltd.		11—12	+½ 5 16 8
1,775,892	Stk.	Feb. 27	4⅝	Newc'tle & G'tesh'd Con.		107—108	+½ 4 5 8
418,460	Stk.	Dec. 30	3½	Do. 3½ p.c. Deb.		90—92	+1 3 16 1
15,000	10	Feb. 27	10	North Middlesex 10 p.c.		20—21	.. 4 15 3
55,940	10	,,	7	Do. 7 p.c.		13½—14½	.. 4 16 7
300,000	Stk.	Apl. 29	8	Oriental, Ltd.		140—143	.. 5 11 11
60,000	5	Mch. 27	7	Ottoman, Ltd.		6—6½	.. 5 7 8
398,490	5	Apl. 29	7	Primitiva Ord.		6⅞—6⅞	.. 5 3 8
796,980	5	Jan. 30	5	Do. 5 p.c. Pref.		4⅞—5⅛	.. 4 15 3
488,900	100	Dec. 2	4	Do. 4 p.c. Deb.		93—95	.. 4 4 3
1,000,000	10	Apl. 29	8	River Plate Ord.		13—13½	.. 5 18 6
312,650	Stk.	Dec. 30	4	Do. 4 p.c. Deb.		93—95	.. 4 4 3
250,000	10	Apl. 10	8	San Paulo, Ltd.		13⅜—14	.. 5 14 4
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.		50—52	.. 4 16 2
135,000	Stk.	Mch. 12	10	Sheffield A		245—247	.. 4 1 0
209,984	,,	,,	10	Do. B		245—247	.. 4 1 0
523,500	,,	,,	10	Do. C		245—247	.. 4 1 0
70,000	10	Nov. 14	10	South African		14½—15½	.. 6 9 0
6,429,895	Stk.	Feb. 13	1⅛	South Met., 4 p.c. Ord.		118—120	.. 4 8 10
1,895,445	,,	Jan. 16	3	Do. 3 p.c. Deb.		83—85	.. 3 10 7
209,820	Stk.	Mch. 12	8	South Shields Con. Stk.		154—156	.. 5 2 7
605,000	Stk.	Feb. 27	5⅓	S'th Suburb'n Ord. 5 p.c.		116—119	.. 4 9 7
60,000	,,	,,	5	Do. 5 p.c. Pref.		118—121	.. 4 2 8
117,058	,,	Jan. 16	5	Do. 5 p.c. Deb. Stk.		120—125	.. 4 0 0
502,310	Stk.	May 14	5	Southampton Ord.		105—110*	+½ 4 10 11
120,000	Stk.	Feb. 27	6⅔	Tottenham A 5 p.c.		120—125	.. 5 8 0
398,940	,,	,,	5⅓	and B 3½ p.c.		103—106	+1 4 19 1
149,470	,,	Dec. 13	4	Edmonton 4 p.c. Deb.		99—102	.. 3 18 5
122,380	10	Dec. 30	8	Tuscan, Ltd.		10¼—10¾	.. 7 8 10
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.		99—101	.. 4 19 0
193,742	Stk.	Feb. 27	5	Tynemouth 5 p.c. max.		106—107	.. 4 13 6
255,636	Stk.	Feb. 13	6½	Wandsworth and Putney	B 3½ p.c.	128—133	.. 4 17 9
80,075	,,	Dec. 30	3		3 p.c. Deb. Stk	73—78	.. 3 16 11
845,872	,,	Feb. 27	5⅛	West Ham 5 p.c. Ord.		99—102	.. 5 0 6
185,000	,,	,,	5	Do. 5 p.c. Pref.		118—120	.. 4 3 4
228,300	,,	Dec. 30	4	Do. 4 p.c. Deb. Stk.		102—107	.. 3 14 9

† Next dividend will be at this rate. Prices marked * are "Ex div."

"ILLUMINATING TRUTHS."

LEAFLETS FOR DISTRIBUTION.

No. 1.—"The Sanitary Aspects of Gas and Electric Lighting."
No. 2.—"The Cleanliness of Illuminants: The Eyesight."
No. 3.—"Fire Risks."
No. 4.—"The Relative Cost of Gas and Electricity, and Matters affecting it."
No. 5.—"On Reliability, with Instances of Misplaced Confidence."
No. 6.—"On Shop Lighting, with Special Reference to the Flame Arc Lamp."
No. 7.—"The Osram Lamp: Fiction and Fact."

This series of Leaflets will be useful, not only for distribution among Householders generally, but for circulation among Shareholders to fortify them with arguments defence of the commodity in which they have invested capital. Copies of each Leaflet should also be kept in every Gas Undertaking's Show-Rooms.

Prices for Quantities on Application to WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

CHIEF METER INSPECTOR, &c. Cardiff Gaslight Company. Applications by May 29.
GENERAL FOREMAN. Barry Gas and Water Department. Applications by May 30.
REPRESENTATIVE (PART SERVICES). No. 4942.
STOKERS. No. 4941.

Situation Wanted.

ENGINEER. No. 4943.

Capitalists Wanted (Erecting and Buying Gas-Works). No. 4940.

Gas Examination Classes.

CORRESPONDENCE COLLEGE COMPANY, CAMBRIDGE.

Plant (Second-Hand) Wanted.

CONDENSER. Shotts Gas-Works.

Plant (Second-Hand), &c., for Sale.

CONDENSERS, ENGINES AND EXHAUSTERS, SCRUBBERS, PURIFIERS, RETORT-HOUSE FITTINGS, &c. Ellis, Etruria Works, near Stoke.
RETORTS, HYDRAULIC MAINS, MOUTHPIECES, PIPES, &c. Gosport Gas-Works.
EXHAUSTING PLANT, CONDENSERS, PURIFIERS, &c. Chesterton Gas-Works.

Stocks and Shares.

BARKING GAS COMPANY. May 27.
CHIGWELL, LOUGHTON, AND WOODFORD GAS COMPANY. May 27.
DARTFORD GAS COMPANY. June 2.
GRAVESEND AND MILTON GAS COMPANY. June 2.
GRAYS AND TILBURY GAS COMPANY. June 2.
HARROW AND STANMORE GAS COMPANY. May 21.
LEA BRIDGE GAS COMPANY. June 2.
LOWESTOFT WATER AND GAS COMPANY. May 27.
MAIDENHEAD GAS COMPANY. May 27.
SOUTH AFRICAN LIGHTING ASSOCIATION. June 2.
SOUTHEND WATER COMPANY. June 2.
TENDRING HUNDRED WATER-WORKS COMPANY. May 27.
UXBRIDGE GAS COMPANY. June 2.
WALKER AND WALLSEND GAS COMPANY. June 3.
WEST KENT GAS COMPANY. June 2.

Patents for Disposal or Licences to Work.

GAS PRODUCERS, &c. Redfern and Co., South Street, Finsbury, E.C.

TENDERS FOR

Bricks and Flags.

LEEDS GAS DEPARTMENT. Tenders by May 25.

Coal and Cannel.

BANGOR (N.W.) GAS DEPARTMENT. Tenders by June 15.
BIRKENHEAD GAS DEPARTMENT. Tenders by May 28.
BOLTON GAS DEPARTMENT. Tenders by May 29.
CAMBORNE GAS COMPANY. Tenders by May 26.
CARLISLE GAS DEPARTMENT. Tenders by June 1.
CLITHEROE GAS DEPARTMENT. Tenders by May 21.
EAST DEREHAM URBAN COUNCIL. Tenders by June 2.
GAINSBOROUGH GAS DEPARTMENT. Tenders by May 26.
GLOUCESTER GASLIGHT COMPANY. Tenders by May 26.
HEREFORD GAS DEPARTMENT. Tenders by May 23.
MANSFIELD GAS DEPARTMENT. Tenders by May 26.
MORECAMBE GAS DEPARTMENT. Tenders by May 29.
OSSETT GAS DEPARTMENT. Tenders by May 25.
PAIGNTON GAS COMPANY. Tenders by June 13.
PETERBOROUGH GAS COMPANY. Tenders by June 8.
RHONDDA GAS AND WATER DEPARTMENT. Tenders by June 4.
SEDGLEY GAS DEPARTMENT. Tenders by June 3.
SHREWSBURY GAS COMPANY. Tenders by June 13.
SKIPTON GAS DEPARTMENT. Tenders by June 1.
SLOUGH GAS COMPANY. Tenders by June 9.
SWADLINCOTE GAS DEPARTMENT. Tenders by May 27.
WINDSOR GASLIGHT COMPANY. Tenders by June 1.
WOMBWELL GAS DEPARTMENT. Tenders by May 27.

Engine and Exhauster.

WEST DERBY UNION. Tenders by May 28.

Fire-Clay Goods.

WINSFORD GAS DEPARTMENT. Tenders by June 4.
WOMBWELL GAS AND WATER DEPARTMENT. Tenders by May 26.

Gasholder (Resheeting).

LIMERICK GAS DEPARTMENT. Tenders by June 1.

Lime.

BIRKENHEAD GAS DEPARTMENT. Tenders by May 28.
LEEDS GAS DEPARTMENT. Tenders by May 25.
LOUGHBOROUGH GAS DEPARTMENT. Tenders by June 4.
SWADLINCOTE GAS DEPARTMENT. Tenders by May 27.

Oxide of Iron (New and Spent).

LIMERICK GAS DEPARTMENT. Tenders by June 1.
SKIPTON GAS DEPARTMENT. Tenders by June 1.

Pipes, Valves, &c.

COVENTRY GAS DEPARTMENT. Tenders by May 25.
RHONDDA GAS AND WATER DEPARTMENT. Tenders by June 4.
SUNBURY GAS COMPANY (Also Laying and Taking Up Old Pipes). Tenders by May 28.

Retort House Fittings, &c.

COVENTRY GAS DEPARTMENT. Tenders by May 25.
WINSFORD GAS DEPARTMENT. Tenders by June 4.

Retort Settings, &c. (Materials and Labour).

WOMBWELL GAS AND WATER DEPARTMENT. Tenders by May 26.

Shed for Oxide.

BRITON FERRY URBAN COUNCIL. Tenders by May 21.

Tar and Liquor.

ACCRINGTON GAS AND WATER BOARD. Tenders by June 8.
HEREFORD GAS DEPARTMENT. Tenders by May 25.
LOUGHBOROUGH GAS DEPARTMENT. Tenders by June 4.
MANSFIELD GAS DEPARTMENT. Tenders by May 26.
SKIPTON GAS DEPARTMENT. Tenders by June 1.

OXIDE OF IRON.

O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.
Offices: City Chambers, LEEDS.
Correspondence invited.

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Thornhill, DEWSBURY.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 54 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 254 Oldham, and 2412 Hop, London.
Telegrams:—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

BENZOL
AND
CARBURINE FOR GAS ENRICHING.
ALSO
THE MAXIM PATENT CARBURETTOR.
For Prices, &c., apply to
THE GAS LIGHTING IMPROVEMENT CO., LTD.,
7, BISHOPSGATE STREET WITHOUT,
LONDON, E.C.
Telegraphic Address: "Carburine, London."

TO Gas Managers, &c., Wanted, Old Condemned GAS-METERS, from 1-light to 1000-light, for destruction to re-claim Metals. Write for Prices, Stating Quantities and Sizes, and if Wets or Drys. Scrap Metals, Drosses, Metal Shop Sweepings, &c., also bought
J. WILSON, Pleasant Grove, York Road, King's Cross, LONDON, N.

FIDDES-ALDRIDGE
SIMULTANEOUS Discharging-Charger.
The one Machine which Discharges and Charges at One Stroke.
See Advertisement, April 28, p. III. of Centre.
ALDRIDGE AND RANKEN,
9, VICTORIA STREET, WESTMINSTER, S.W.
Telegrams: "MOTORPATHY, LONDON." Telephone: 5118 WESTMINSTER.

OXIDE OF IRON.
(NATURAL)
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS.
BALE & CHURCH,
5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.
SPECIALLY prepared for the Manu- facture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.,
with which is amalgamated WM. PEARCE & SONS, LTD.
36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341 AVENUE.

LUX'S GAS PURIFYING MASS.
See Advertisement on p. 463.
FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

BY adopting Cripps's Bye-Pass Valves inside your Purifiers, you can relieve the Back-Pressure in the Lower Tiers when the Purifying Material gets hard. They are extremely useful and economical.
Sole Makers: C. & W. WALKER, LIMITED, Midland Iron-Works, Donnington, near Newport, SHROPSHIRE.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers, Works: BIRMINGHAM, LEEDS, WAKEFIELD, and SUNDERLAND.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

PINCHBECK'S Meters and Burglar PROOF STRONG BOX.
See illustrated advertisement, April 28, p. I. of Centre.
J. PINCHBECK & Co., Adams Place, George's Road, HOLLOWAY, N.

D. ANDERSON AND COMPANY, GAS LIGHTING ENGINEERS AND CONTRACTORS,
73, FARRINGDON ROAD, LONDON, E.C.
Telegrams: "DACOLIGHT LONDON." Telephone: 2336 HOLBORN.

AMMONIACAL Liquor wanted. BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, WAKEFIELD, AND SUNDERLAND.

GAZINE—A radical Solvent and Preventative of Naphthalene deposits, and the Automatic cleaning of Mains and Services.
It is also used for the Enrichment of Gas, and has an illuminating value double that of 90 per cent. Benzol.
Supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-TYNE.
Telegrams: "DORIC," Newcastle-on-Tyne. National Telephone No. 2497.

INSURANCE—H. F. LAMSDEN, Insurance Broker (Established 1888), 19 & 21, Queen Victoria Street, London, E.C., quotes BOTTOM LONDON RATES FOR EMPLOYERS' LIABILITY UNDER THE NEW ACT. Collective Fidelity Guarantee and THIRD PARTY, INCLUDING DAMAGE CAUSED BY GAS EXPLOSION, Marine, Fire, and Loss of Profit in case of Fire. Motor-Car, Boilers, Engines, Lifts, Cranes, all classes of Machinery, and Plant. Payment of Trade Acceptances and Open Credits Guaranteed. Excess Bad Debt Policies fixed on the most favourable Terms.

GAS TAR wanted. BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, WAKEFIELD, AND SUNDERLAND.

"VITERNUS" METALLIC PAINT FOR GAS-WORKS PLANT.
JOHN E. WILLIAMS AND CO., LOWER MOSS LANE, MANCHESTER, S.W.
Telegrams: "ENAMEL." National Telephone 1759.

BRISTOL RECORDING GAUGES AND THERMOMETERS.

J. W. & C. J. PHILLIPS, 23, COLLEGE HILL, LONDON, E.C., and 7, PARK SQUARE, LEEDS.

THE KEITH LIGHT.

4800 INSTALLATIONS NOW IN USE.
SEE illustrated advertisement in next week's issue.
JAMES KEITH AND BLACKMAN CO., LTD., 27, Farringdon Avenue, LONDON. E.C.

AMMONIA. Consumers in any form are invited to correspond with CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.

DELLWIK-FLEISCHER WATER GAS.

BLUE WATER GAS, CARBURETTED WATER GAS, SELF-CARBURETTING.
FOR list of towns in which Plant has been Installed, see advertisement in the "JOURNAL" for May 5, p. 322.
The DELLWIK-FLEISCHER WATER GAS SYNDICATE, Belgravia Chambers, 72, Victoria Street, Westminster, LONDON, S.W. Telegraphic Address "Dellwik, London."

AMMONIACAL Liquor wanted. CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.
Telegrams: "CHEMICALS."

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
Telegrams: SATURATORS, BOLTON. Telephone 0848.

SULPHURIC ACID.

SPECIALLY prepared for Sulphate of AMMONIA Makers by
CHANCE AND HUNT, LIMITED,
Works: OLDBURY, WEDNESBURY, AND STAFFORD.
Address Correspondence and Inquiries to OLDBURY, WORCS.
Telegrams: "CHEMICALS, OLDBURY."

GAS OILS.

MEADE-KING, ROBINSON, & CO. Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, EXCHANGE STREET, MANCHESTER, and 11, OLD HALL STREET, LIVERPOOL.

PATENTS AND TRADE MARKS PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

CITY AND GUILDS.

FULL Year's Course now Starting in GAS ENGINEERING and GAS SUPPLY. Fees low. Success certain.
Secretary, CORRESPONDENCE COLLEGE COMPANY, 26, Green Street, CAMBRIDGE.

BURGESS HILL AND ST. JOHN'S COMMON GAS COMPANY.

MANAGER.
APPLICANTS for the above are Hereby Informed that the POST IS NOW FILLED. Testimonials will be RETURNED on receipt of Stamped Addressed Envelope.
S. H. NORMAN, Secretary, Burgess Hill, SUSSEX.

ENGINEER (Age 23) is Desirous of finding permanent Shore Engagement. Has had Six Years Workshop Experience (Thames Iron-Works Company) and Eighteen Months Sea Service in the P. & O. Good References. Fair knowledge of Electrical Work, &c.
Address No. 4943, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Two Non-Unionist Stokers (One Leader), Twelve-Hour Shifts, for Works of 25 Millions.
Apply, by letter, to No. 4941, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

A FIRM of Gas Engineers require a REPRESENTATIVE to call at Gas-Works in the Eastern and Southern Districts, on Commission. Exclusive Services are not required.
Apply, stating Age, Experience, and Terms, to No. 4942, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a few Gentlemen with Capital, interested in Gas-Works, to form SYNDICATE for ERECTING NEW WORKS in suitable Districts, and BUYING UP existing Works which have been neglected, for Exploiting the same and Selling to Local Authorities; Advertiser frequently meeting opportunities, but for want of Capital cannot take advantage.
Address No. 4940, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

BARRY URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT).

APPOINTMENT OF GENERAL FOREMAN.
WANTED, a General Foreman in the Gas and Water Department of the above-mentioned Council.
Wages, £2 10s. per Week.
Particulars of Duties may be obtained from Mr. T. E. Franklin, Engineer and Manager, Gas-Works, Barry, to whom Applications, stating Age, Qualifications, and Experience, and *copies* of Three recent Testimonials, should be sent on or before the 30th inst.
Canvassing is prohibited.
T. B. TORDOFF, Clerk.
Council Offices, Barry, May 12, 1908.

CARDIFF GASLIGHT AND COKE COMPANY.
THE Directors of this Company require the Services of a CHIEF METER INSPECTOR. He must be thoroughly conversant with the Requirements of Gas Consumers, and must be able to give Expert Advice and Estimates of Cost in regard to all Gas-Fitting Work, especially Installations of Incandescent Gas Lighting.
Salary, £175 per Annum.
Applications, marked "Chief Inspector," stating whether Married or Single, giving Previous Experience, and enclosing *copies* of Three recent Testimonials, to be forwarded to the undersigned not later than Friday, May 29 inst.
Particulars may be obtained from the undersigned.
Canvassing will disqualify.
By order,
GEORGE CLARKE, Secretary.
Gas Offices, Cardiff, May 2, 1908.

WANTED, a Good Second-Hand 8-inch CONDENSER.
Particulars to WILLIAM PEACOCK, Manager, Gas-Works, SHOTTS, N.B.

THE Gosport Gas and Coke Company have FOR SALE the following SECOND-HAND PLANT, from a dismantled Retort-Bench, which consisted of:—
Four Beds of Seven ⌂ RETORTS, 18 ft. by 14 ft.
Eight Cast-Iron HYDRAULIC MAINS, 9 ft. by 1 ft. 6 in. diameter, Flat Top, to receive Seven Dip Pipes.
28 MOUTHPIECES, with Self-Sealing Lids.
6-inch to 5-inch ASCENSION PIPES.
5-inch to 4-inch H PIPES.
4-inch DIP PIPES.
Also a Quantity of SCRAP IRON, including Wrought-Iron Tie-Rods, Cast-Iron Buckstays, &c.
Can be seen at the Gas-Works, GOSPORT.

OFFERS are invited for the following GAS PLANT, which may be seen by Appointment at the Chesterton Gas-Works:—
One Complete EXHAUSTING PLANT, consisting of 6-H.P. National GAS-ENGINE, Waller's 2000 Cubic Feet per hour EXHAUSTER, Bye-pass, Governor, and all necessary Valves and Connections.
One set of CONDENSERS, consisting of 230 feet lineal of 6-inch horizontal Pipes.
One set of four 6 feet square LUTELESS PURIFIERS, in one block, with Valves, Connections, Bearers, Grids, and Lid-Lifter complete.
A. A. T. BOTTELEY.
Gas-Works, Chesterton, Staffs.

DISMANTLING of Gas Plant, Etruria, Staffordshire.
CONDENSER, 50 ft. high 3 ft. 6 in. diameter. By Walker's.
ENGINES and EXHAUSTER, 50,000 and 80,000 Cubic Feet per Hour each, with Valves, Regulators, &c. By Bryan Donkin and Co.
SCRUBBERS, by Walker's, 8 feet and 10 feet diameter, 59 feet body, 72 feet high, with Tar-Extracting Washer and Spiral Staircase.
PURIFIERS. Set of Ten, 30 ft. by 15 ft. by 5 ft.; with 24-inch Lutes, Valves, Lifting Gear, &c.
RETORT-HOUSE FITTINGS, GIRDERS, Wrought-Iron PRINCIPALS, 54 feet, 61 feet, and 67 feet Span, TURNTABLES, &c., &c.
JOHN ELLIS, Etruria Gas-Works, near STOKE; or MILES PLATTING, MANCHESTER.

WE have the following New and Over- hauled Second-Hand PLANT FOR SALE:—
Gasholder, 8500 cubic feet, New Steel Tank.
Gasholders, 35 ft. by 10 ft., Cast-Iron Tank.
" 45 ft. by 12 ft.
" 50 ft. by 15 ft. 4 in., Telescopic,
Overhauled and re-erected in new Steel Tanks.
8-inch, 9-inch and 10-inch Condensers.
Kirkham Washer (200,000 cubic feet per day).
Walker's Purifying Machine.
Exhausters and Engines, Single and Combined, 2000 to 60,000 feet per hour.
Scrubber, 7 ft. diameter, 55 ft. high.
Purifiers, sets 6-fts., 10-fts., 12-fts., and 20-fts.
Plans and Quotations of new Sets.
6-inch to 18-inch Station Meters, Governors, &c. New Drums.
Tar and Liquor Pumps.
Producer-Gas Plants for 150 to 300 H.P.
Boilers, Tanks, and all requisites for Gas-Works.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Thornhill, DEWSBURY (Yorks.).

BOROUGH OF MORECAMBE.
THE Gas Committee invite Tenders for the Supply of their requirements for GAS COAL for One or Two Years—approximately 9000 Tons per Year.
Specifications and Forms of Tender may be obtained upon Application to the undersigned.
Tenders to be delivered on or before the 29th day of May, 1908, endorsed "Tender for Coal," and addressed to the undersigned.
The Gas Committee do not bind themselves to accept the lowest or any Tender.
H. BLAKEY, Engineer and Manager.
Gas Offices, Morecambe, May 12, 1908.

CITY OF LIMERICK.

OXIDE.
THE Gas Committee are prepared to receive and consider TENDERS for 200 Tons of BOG ORE, suitable for Purification.
Also TENDERS for 200 Tons of SPENT OXIDE.
Samples and full Particulars can be had on Application to the Engineer and Manager, Mr. H. Hawkins, Gas-Works, Dock Road, Limerick.
Tenders, endorsed "Oxide," must be sent in not later than Five p.m., June 1, 1908, to the Chairman, Gas Committee, Gas Offices, William Street, Limerick.
The Committee do not bind themselves to accept the lowest or any Tender.
By order,
H. HAWKINS, C.E., Engineer and Manager.

CITY OF LIMERICK.

TO GASHOLDER MAKERS, &c.
THE Gas Committee are prepared to receive and consider TENDERS for RESHEETING One Single-Lift Gasholder, 80 ft by 24 ft.
Full Particulars can be had from the Gas Engineer and Manager, Mr. H. Hawkins, Gas-Works, Dock Road, Limerick.
The Committee do not bind themselves to accept the lowest or any Tender.
Tenders, endorsed "Gasholder," must be sent in addressed to the Chairman, Gas Committee, Gas Offices, William Street, Limerick, not later than Five p.m., June 1, 1908.
By order,
H. HAWKINS, C.E., Engineer and Manager.

TO STEEL PIPE AND IRONWORK CONTRACTORS.

THE Gas Committee of the Coventry Corporation invite TENDERS for the Delivery and Fixing of FOUL MAINS and CONNECTIONS in new Retort-House at their Foleshill Works, comprising about 1070 feet of 24-inch diameter Riveted Steel Flanged Pipes, 70 feet of 30-inch diameter ditto, and about 18 Tons of CASTINGS and Sundry VALVES.

Form of Tender, with Specification, Bill of Quantities, General Conditions, and Copy of Drawings, may be obtained on Application to the undersigned, and on payment of 10s., which will not be returned.

The Committee do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, addressed to the Chairman of the Gas Committee, Gas-Works, Coventry, must be delivered by first post on Monday, the 25th of May next, endorsed "Tender for Steel Foul-Mains."

FLETCHER W. STEVENSON,
Engineer and General Manager.

Gas-Works, Coventry,
May 12, 1908.

LOUGHBOROUGH CORPORATION.
(GAS DEPARTMENT.)

TENDERS FOR LIME.

THE Gas Committee invite Tenders for the Supply of 800 Tons (more or less) of Best Hand-Picked LIME for Purifying purposes, delivered at Loughborough—London and North Western Railway Station preferred.

To be delivered as required between the 1st of July, 1908, and the 30th of June, 1909.

Tenders to be endorsed "Tender for Lime," and addressed and delivered to H. Perkins, Esq., Town Clerk, Town Hall, Loughborough, not later than Thursday, the 4th of June.

The Committee do not bind themselves to accept the lowest or any Tender.

EDWARD ONIONS,
Engineer and Manager.

May 13, 1908.

LOUGHBOROUGH CORPORATION.
(GAS DEPARTMENT.)

TENDERS FOR TAR AND AMMONIACAL LIQUOR.

THE Gas Committee invite Tenders for the Surplus TAR and AMMONIACAL LIQUOR for Twelve Months from the 1st of July, 1908, to the 30th of June, 1909.

Estimated amount of Tar, 600 Tons; Liquor, 1000 Tons.

The Contractor to state Price for Liquor at 5° Twaddel, and per Ton extra for every ½° above 5°.

The Corporation to deliver both Tar and Liquor into Contractor's Boats at the Derby Road Wharf, Loughborough.

Tenders to be endorsed "Tender for Tar and Liquor," and addressed and delivered to H. Perkins, Esq., Town Clerk, Town Hall, Loughborough, not later than Thursday, the 4th of June.

The Committee do not bind themselves to accept the highest or any Tender.

EDWARD ONIONS,
Engineer and Manager.

May 13, 1908.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Corporation of Birkenhead are prepared to receive TENDERS for the Supply of Screened COAL, Through and Through COAL NUTS, and CANNEL for Gas-Making purposes for a period of Twelve Months commencing from the 1st of July, 1908.

Form of Tender, together with any further Information, may be obtained from Mr. T. O. Paterson, C.E., Gas Engineer, Gas-Works, Birkenhead.

Tenders (accompanied by copy of recent Analyses), stating the Price per Ton delivered to the Gas-Works Railway Siding, must be sent in to me, sealed and endorsed "Tender for Gas-Works Coal," not later than Five o'clock in the afternoon of Thursday, the 28th of May, 1908.

All deliveries to be made from time to time according to the requirements of the Engineer.

The parties whose Tender may be accepted will be required to enter into a Contract containing a Clause as to the payment of the Rate of Wages and the observance of the Hours of Labour recognized and agreed upon between the Trades' Unions and the Employers in the locality in which the work for carrying out the Contract is to be performed.

The Corporation do not bind themselves to accept the lowest or any Tender.

By order,
JAMES FEARNLEY,
Town Clerk.

Town Hall, Birkenhead,
May 15, 1908.

TO LIME MERCHANTS.

THE Corporation of Birkenhead are prepared to receive TENDERS for the Supply of 1000 Tons or thereabouts of LIME for Gas Purifying, delivered free into their Gas-Works during the ensuing Twelve Months, and as directed by the Gas Engineer, Mr. T. O. Paterson, from whom Forms of Tender and all Particulars may be obtained.

Tenders, sealed and endorsed "Tender for Lime," to be sent in to me not later than Five p.m. on Thursday, the 28th of May, 1908.

The parties whose Tender may be accepted will be required to enter into a Contract containing a Clause as to the payment of the Rate of Wages and the observance of the Hours of Labour recognized and agreed upon between the Trades' Unions and the Employers in the locality in which the work for carrying out the Contract is to be performed.

The Corporation do not bind themselves to accept the lowest or any Tender.

By order,
JAMES FEARNLEY,
Town Clerk.

Town Hall, Birkenhead,
May 15, 1908.

LEEDS CORPORATION GAS-WORKS.

TENDERS are required as below:—

For PRESSED and COMMON RED BRICKS.
For 2½-inch, 3-inch, and 4-inch SELF-FACED BRADFORD or HALIFAX FLAGS.

Forms of Tender may be had on Application to the undersigned.

Endorsed Tenders, addressed to the Town Clerk, Town Hall, Leeds, to be delivered not later than Monday, the 25th inst.

The Committee do not bind themselves to accept the lowest or any Tender.

R. H. TOWNSLEY,
General Manager.

Gas Offices, East Parade,
Leeds, May 16, 1908.

LEEDS CORPORATION GAS-WORKS.

THE Gas Committee are prepared to receive TENDERS for the Supply of about 11,000 Tons of Best Craven or Derbyshire LIME, required for the Purification of Gas at the several Gas-Works during the Twelve Months commencing on the 1st of June, 1908.

Forms of Tender may be had on Application to the undersigned.

Sealed Tenders, endorsed "Tender for Lime," addressed to the Town Clerk, Town Hall, Leeds, to be delivered not later than Monday, the 25th inst.

The Committee do not bind themselves to accept the lowest or any Tender.

R. H. TOWNSLEY,
General Manager.

Gas Offices, East Parade,
Leeds, May 16, 1908.

HEREFORD CORPORATION.
(GAS DEPARTMENT.)

TENDERS FOR TAR.

THE Gas Committee are prepared to receive TENDERS for the Purchase of the Surplus TAR made at the Works during the Twelve Months ending June 30, 1909.

Tenders, addressed to the Chairman of the Gas Committee, to be delivered at the Town Hall not later than Saturday, the 25th inst., endorsed "Tender for Tar."

The lowest or any Tender not necessarily accepted.

W. W. TOWNSEND,
Engineer and Manager.

Gas-Works, Hereford,
May 12, 1908.

HEREFORD CORPORATION.
(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the Supply of about 11,500 Tons of Screened GAS COAL or NUTS, and about 500 Tons of CANNEL, to be delivered at the Gas-Works Siding as required, during the Twelve Months ending June 30, 1909.

Sealed Tenders, addressed to the Chairman of the Gas Committee, to be delivered at the Town Hall not later than Saturday, the 23rd inst.

Forms of Tender to be obtained from the undersigned.

The lowest or any Tender not necessarily accepted.

W. W. TOWNSEND,
Engineer and Manager.

Gas-Works, Hereford,
May 12, 1908.

SUNBURY GAS CONSUMERS' COMPANY, LIMITED, SUNBURY, MIDDLESEX.

THE Directors of the above Company invite TENDERS for Supplying and Laying 1500 Yards of 10-inch Cast-Iron Socket and Spigot GAS-MAIN, in 9-feet Lengths, with all the necessary Syphons, Connections, &c. The price to include the Taking up of existing 6-inch Main, and Laying the 10-inch Main in the same Trench.

Tenders must specify Weight per Yard of 10-inch Main; the weight per Pipe being not less than 4 cwt. 2 qrs. 21 lb.

Full Particulars and Specification can be obtained of Mr. S. Bark, the Company's Engineer and Manager.

Sealed Tenders, addressed to the Chairman, H. H. Allen, Esq., to be received at these Offices, endorsed "Tender for Main," not later than the 28th inst.

The Directors do not bind themselves to accept the lowest or any Tender.

By order,
J. W. WYNN,
Secretary.

Gas-Works, Sunbury,
May 12, 1908.

SWADLINCOTE DISTRICT URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE Gas Committee of the above Council are prepared to receive TENDERS for—

LIME.

The Supply of about 150 Tons of Best Hand-Picked Buxton LIME, to be delivered at the Gas-Works in such quantities and at such times as may be required during the Twelve Months ending June 30, 1909.

GAS COAL.

The Supply of 4500 Tons (more or less) of Best Screened GAS COAL, to be delivered in such quantities as may be required during the Twelve Months ending June 30, 1909.

All Particulars and Forms of Tender may be obtained from Mr. G. B. Smedley, C.E., the Engineer and Manager.

Tenders must be on the Council's Forms and Envelope, and accompanied by Analysis, and must be delivered to the undersigned on or before Twelve noon, May 27, 1908, endorsed "Lime," or "Gas Coal," as the case may be.

The Council do not bind themselves to accept any Tender.

W. A. MUSSON,
Clerk to the Council.

Gas-Works, Swadlincote,
May 11, 1908.

BANGOR CORPORATION.

THE Gas Committee invite Tenders for the Supply of 4500 Tons of best Screened GAS COAL, delivered free on rail, Bangor Station (L. and N. W. Railway), between Aug. 1, 1908, and July 1, 1909, in such quantities, monthly, as required.

The Gas Committee reserve the right to divide the quantity between two or more Contractors.

The lowest or any Tender not necessarily accepted.

Forms of Tender may be had from the undersigned.

Tenders must be on the prescribed Forms, and accompanied by Analysis, and addressed to the Chairman of Gas Committee, Gas Office, Bangor, N. Wales, on or before June 15, 1908.

JOHN SMITH,
Manager.

Gas-Works, Bangor, N.W.,
May 16, 1908.

WINSFORD URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE above Council are prepared to receive TENDERS for the Supply, Delivery, and Fixing of NEW RETORTS AND FITTINGS at their Works.

Specifications and Forms of Tender may be obtained upon Application to Mr. F. Sidwell, Engineer, Gas-Works, Winsford.

Tenders, endorsed "Gas Improvements," to be delivered to the undersigned on or before Wednesday, the 4th of June next.

The Council do not bind themselves to accept the lowest or any Tender.

J. H. COOKE,
Clerk to the Council.

Council Office, Russell Street,
Winsford, May 15, 1908.

GAINSBOROUGH URBAN DISTRICT COUNCIL
(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Gas Committee of the above Council invite TENDERS for the Supply of 8000 Tons of best GAS COAL (Screened, Unscreened, and Nuts), to be delivered at the Great Central Railway Station, Gainsborough, between the 1st of July, 1908, and the 30th of June, 1909, in such quantities, monthly, as may be required.

Sealed Tenders, endorsed "Tender for Gas Coal," giving Full Particulars of the Coal offered, to be addressed to the Chairman of the Gas Committee, must be delivered at the Gas-Works, Gainsborough, not later than the 26th inst.

No Special Form of Tender issued.

The Committee do not bind themselves to accept the lowest or any Tender.

JOHN BALDWIN,
Manager.

Gas-Works, Gainsborough,
May 11, 1908.

RHONDDA URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)

TENDERS FOR GAS COALS, CANNEL AND CAST-IRON PIPES.

THE Council are prepared to receive TENDERS for the following:—

1.—The Supply from 1st of July, 1908, to the 30th of June, 1909, of about 25,000 Tons of GAS COALS and CANNEL, delivered at the Porth and Ystrad Gas-Works.

2.—For the Supply and Delivery of CAST-IRON PIPES required from the 1st of July, 1908, to the 30th of June, 1909.

Specifications and Forms of Tender can be obtained on Application to the Engineer and Manager, Mr. Octavius Thomas, Gas and Water Office, Pentre, Rhondda, Glam.

Tenders to be addressed to the "Chairman of the Gas and Water Committee," endorsed "Tender for Gas Coal," "Cannel," or "Cast-Iron Pipes," as the case may be, and delivered at my Office not later than Ten a.m. on Thursday, the 4th of June, 1908.

The Contractors will be required to pay the Standard Rate of Wages recognized in the district.

The Council do not bind themselves to accept the lowest or any Tender.

WALTER P. NICHOLAS,
Clerk to the Council.

Public Offices, Pentre,
Rhondda, Glam., May 15, 1908.

SKIPTON URBAN DISTRICT COUNCIL.

TENDERS FOR GAS NUTS.

THE Council invite Tenders for the Supply of about 8000 Tons of best GAS NUTS, Washed, Unwashed, or Nuts Slack, to be delivered free into the Council's Boats at the Pit Wharf, or at the Railway Station, Skipton, or at the Council's Wharf, adjoining the Gas-Works in Skipton, on the Leeds and Liverpool Canal, between June 30, 1908, and July 1, 1909, in monthly quantities.

Full Particulars as to Periods and Quantities of Deliveries, &c., and Form of Tender, may be obtained from the Manager, Mr. J. H. Woodward, Gas-Works, Skipton, and Tenders, endorsed "Tender for Gas Coal," are to be sent to the Chairman of the Gas Committee Gas-Works, Skipton, on or before June 1, 1908.

TAR.

The Council also invite TENDERS for the Purchase and Removal of Surplus TAR produced at the Skipton Gas-Works between the 30th of June, 1908, and the 1st of July, 1909.

Tenders, endorsed "Tar," are to be sent in on or before the 1st of June, 1908.

OXIDE OF IRON.

The Council also invite TENDERS for the Supply of about 40 Tons of NATURAL OXIDE OF IRON, delivered at Skipton Railway Station.

Tenders, endorsed "Oxide," are to be sent in on or before June 1, 1908.

The lowest or any Tender not necessarily accepted.

RICHARD WILSON,
Clerk to the Council.

THE Directors of the Camborne Gas Company, Limited, are prepared to receive TENDERS for the Supply of 1750 Tons of GAS COAL f.o.b., or, alternately, c.i.f., Hayle, for delivery to the order of the said Company between June 30, 1908, and June 30, 1909.

Tenders will be received up to the 26th inst., and should be addressed to

W. BAILEY,
Secretary.

Gas Offices, 12, Trelowarren Street,
Camborne, May 12, 1908.

ACCRINGTON DISTRICT GAS AND WATER BOARD.

THIS Board invite Tenders for the Surplus TAR and AMMONIACAL LIQUOR which may be produced at the Accrington and Great Harwood Works of the Board, during the Year from the 1st of July next to the 30th of June, 1909.

The estimated quantity of Tar is 2000 Tons; and Liquor, 6000 Tons.

Sealed Tenders, endorsed "Tar and Liquor," addressed to the Chairman of the Board, must be in my hands on or before Monday, the 8th of June.

By order,
CHARLES HARRISON,
General Manager.

General Offices, Accrington,
May 4, 1908.

BOROUGH OF CLITHEROE.
(GAS DEPARTMENT.)

TENDER FOR GAS COAL.

THE Gas Committee invite Tenders for Screened GAS COAL, NUTS, and CANNEL, to be delivered at the Gas-Works Siding, during the Year ending June 30, 1909.

Particulars and Forms of Tender may be obtained from the undersigned

Sealed Tenders, endorsed "Tender for Gas Coal," addressed to the Chairman of the Gas Committee, to be delivered at my Office on or before Thursday, the 21st of May, 1908.

ROBT. BARRETT,
Engineer and Manager.

Gas-Works, Clitheroe,
May 5, 1908.

WOMBWELL URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)

THE Gas Committee of the above Council invite TENDERS for the MATERIALS and LABOUR, separately or combined, required in the Erection of 3 (Three) SETTINGS OF RETORTS.

Full Particulars on Application to the undersigned, at the Gas-Works, Wombwell.

Tenders, endorsed "Retorts," to be delivered at the Gas-Works, Wombwell, on or before Tuesday, the 26th inst.

The Committee do not bind themselves to accept the lowest or any Tender.

P. DAWSON WALMSLEY, B.Sc.,
Engineer and Manager.

Gas-Works, Wombwell,
May 16, 1908.

TO COAL CONTRACTORS AND OTHERS.

THE Sedgley Urban District Council invite TENDERS for Supplying 750 to 1000 Tons of GAS COAL, the deliveries to be made at Shut End Siding at such times and in such quantities as may be directed.

It is desirable that a statement of an Analysis of the quality of a Sample of the Coal to be supplied be sent with the Tenders.

Sealed Tenders, marked "Coal," must reach me on or before the 3rd of June, 1908.

The Council do not bind themselves to accept the lowest or any Tender.

By order,
JOSEPH SMITH,
Clerk to the Council.

Offices: High Holborn,
Sedgley, May 12, 1908.

BRITON FERRY URBAN DISTRICT COUNCIL.

THE above Council invite Tenders for the Construction and Erection of an OXIDE-SHED at the Briton Ferry Gas-Works, in accordance with Plan and Specification which may be inspected on Application to John Mogford, Esq., Gas Engineer, Gas-Works, Briton Ferry.

Sealed Tenders, endorsed "Oxide-Shed," to be delivered to me at the Council Offices, Briton Ferry, not later than Twelve Noon on Thursday, the 21st of May, 1908.

No Tender necessarily accepted.

Tenders to be subject to the Condition that the person tendering shall pay his employees the Trade Union Rate of Wages.

Dated this 15th day of May, 1908.

TREVOR H. HUNTER,
Clerk to the Briton Ferry Urban District Council.

PETERBOROUGH GAS COMPANY.

TENDER FOR COAL.

THE Directors of the above Company invite TENDERS for the Supply of 14,000 Tons of Best Screened Silkstone GAS NUTS for One Year, commencing the 1st of July next.

The Tenders must state the Price of the Nuts delivered into Waggons at the Pit, the Waggon Hire, and the Railway Rate to Peterborough.

Tenders to be sent in by the 8th of June, 1908, endorsed "Coal," and addressed to the Chairman of the Gas Company, Gas-Works, Peterborough.

The Directors do not bind themselves to accept the lowest or any Tender.

Special Tender Forms are not provided.

JOHN BARTON,
Secretary and Manager.

Gas-Works, Peterborough,
May 16, 1908.

SLOUGH GAS AND COKE COMPANY.

THE Directors are prepared to receive TENDERS for the Supply of 5500 Tons of Best GAS COAL (Nuts), to be delivered at the Company's Siding on the Great Western Railway at Slough in the usual Monthly Quantities as may be required during the period of One Year from the 1st of July, 1908.

Tenders should state description of Coal and Colliery from where Coal is obtained.

Payment for Coal on or before the 20th of the following Month after delivery.

Tenders to be delivered to the undersigned, endorsed "Tender for Gas Coal," on or before Tuesday, the 9th prox.

ARTHUR THOMAS,
Secretary.

High Street, Slough,
May 15, 1908.

SHREWSBURY GASLIGHT COMPANY.

TENDERS FOR COAL.

THE Directors of the Shrewsbury Gas-light Company, invite TENDERS for the Supply of about 18,000 Tons of Screened GAS COALS or Washed GAS NUTS, to be delivered free at the Great Western or London and North Western Goods Yard, Shrewsbury, during the Year commencing July 1, 1908, and ending June 30, 1909.

The Directors reserve to themselves the right to divide the quantity into Two or more Contracts, and do not bind themselves to accept the lowest or any Tender.

Tenders must be made on Forms (containing further Particulars) which may be obtained on Application at the Company's Works, or by post, and must be sent to the undersigned on or before the 13th day of June, 1908.

By order,
WM. BELTON, Assoc.M.Inst.C.E.,
Secretary and Manager.

Gas-Works, Shrewsbury,
May 13, 1908.

PAIGNTON GAS COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the Paignton Gas Company are prepared to receive TENDERS for the Supply of 4500 to 5000 Tons of Best Approved GAS COALS, to be delivered in such quantities and at such times as may be required, and to weigh 20 cwt. to the Ton over the Gas Company's Weighbridge.

Tenders to be accompanied by practical working Analyses, stating the Price of the Coal delivered at Paignton Station, Great Western Railway, free of all charges.

Forms of Tender are not supplied.

The Directors do not bind themselves to accept the lowest or any Tender.

Further Particulars may be obtained from Mr. C. G. Dawson only.

Sealed Tenders, endorsed "Tender for Coal," specifying the Description and Quality of the Coal, to be sent on or before the 13th day of June next, addressed to the undersigned, at the Gas Offices, 1A, Victoria Street, Paignton.

F. W. PUDDICOMBE,
Secretary.

Paignton, May 12, 1908.

MANSFIELD CORPORATION.
(GAS DEPARTMENT.)

TENDERS FOR GAS COAL AND CANNEL,
AND
TENDERS FOR SURPLUS TAR.

COAL.

THE Gas Committee are prepared to receive TENDERS for 2000 Tons of CANNEL and 12,000 Tons of Best Screened GAS COAL, delivered at Mansfield Station for One Year from the 1st of June, 1908, to the 31st of May, 1909.

TAR.

TENDERS for the Surplus TAR made from the 1st of June, 1908, to the 31st of May, 1909.

Tenders, endorsed "Coals" or "Tar," as the case may be, to be sent to J. Harrop White, Esq., Town Clerk, Mansfield, on or before the 26th of May, 1908.

Particulars and all other Information from the undersigned.

NOTE: *No Special Forms of Tender provided.*

The Committee do not bind themselves to accept the lowest or any Tender.

ARTHUR GRAHAM,
Engineer and Manager.

Gas-Works, Mansfield,
May 6, 1908.

GLOUCESTER GASLIGHT COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the above Company invite TENDERS for the Supply of about 34,000 Tons of GAS COAL for One Year from the 1st day of July next, in such monthly quantities as may be required by the Company.

Tenders to state the price delivered at the Midland Railway Sidings, Hempsted, near Gloucester, or the Great Western Railway Wharf, Llanthony, Gloucester; or, if sent (as preferred) by Water, the price f.o.b., and also the price delivered at the Gas Company's Wharf on the Gloucester and Berkeley Canal.

Further Particulars and Forms of Tender may be obtained of the undersigned.

Sealed Tenders, endorsed "Tender for Coal," specifying the Description and Quality of the Coal, to be addressed to the Chairman, Gas Offices, Eastgate Street, Gloucester, and delivered not later than Tuesday, the 26th day of May inst.

The Directors reserve to themselves the right to accept the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any Tender.

By order,
WILLIAM E. VINSON,
Secretary.

Gas Offices, Gloucester,
May 4, 1908.

WINDSOR ROYAL GASLIGHT COMPANY.

SEALED Tenders required by the 1st of June for Supplying 3000 Tons of South Yorkshire Silkstone GAS COALS (and no others), to be delivered at the Great Western Railway Station, Windsor, over Twelve Months ending the 30th of June, 1909.

No Special Form of Tender supplied or required, and no pledge is given that the lowest or any Tender will be accepted.

JOHN HENRY STRANGE,
Secretary.

2, Victoria Street, Windsor,
May 6, 1908.

THE East Dereham Urban District Council are prepared to receive TENDERS for the Supply of about 1600 Tons of Screened GAS COAL or NUTS for the ensuing Year.

Particulars and Form of Tender to be had of the undersigned.

Tenders, marked "Coals," to be sent in by Ten a.m. on Tuesday, the 2nd of June, 1908, to

B. H. VORES,
Clerk to the Urban District Council.

East Dereham, May 9, 1908.

WEST DERBY UNION.

TENDERS are invited for a Combined GAS-ENGINE AND EXHAUSTER (Capacity, 6000 feet per hour) for Walton Workhouse Gas-Works, Rice Lane, Liverpool.

Copies of Specification and Conditions of Contract may be had on Application to Isaac Carr, M.Inst.C.E., Farnworth, Widnes.

Tenders, endorsed "Exhauster," to be sent to the undersigned on or before the 28th of May, 1908.

HARRIS P. CLEAVER,
Clerk.

Union Offices, Brougham Terrace,
Liverpool, May 12, 1908.

CITY OF CARLISLE.

THE Carlisle Gas Committee are pre-pared to receive TENDERS for the COAL and CANNEL required at their Works during One Year from the 1st of July next.

Tenders, endorsed "Coal," and addressed to the Chairman of the Gas Committee, to be delivered at the Gas-Works Offices, Victoria Viaduct, Carlisle, not later than Monday, June 1, 1908.

Form of Tender and other Particulars may be had on Application to the undersigned.

W. J. SMITH, B.Sc.,
Engineer and Manager.

Gas-Works, Carlisle,
May 13, 1908.

OSSETT CORPORATION.
(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Gas Committee invite Tenders for the Supply of 11,000 Tons of Screened GAS COAL, from the 1st of July next.

Specification and Form of Tender may be had on Application to Mr. Arnold E. Mottram, Engineer and Manager, Gas-Works, Ossett.

Tenders to be sent in by Monday, May 25, addressed to the undersigned, and endorsed "Tender for Coal."

W. BROOK,
Town Clerk.

Town Hall, Ossett,
May 12, 1908.

COUNTY BOROUGH OF BOLTON.

TENDERS FOR COAL.

THE Gas and Lighting Committee invite TENDERS, from Colliery Proprietors only, for the Supply of Screened and Unscreened GAS COAL, COBBLES, and NUTS required during the Year ending the 30th of June, 1909.

Specifications and Forms of Tender may be obtained on Application to Mr. Wm. Walch, Office Superintendent, Gas Offices, Bolton.

Sealed Tenders, endorsed "Tender for Coal" and addressed to the Chairman of the above Committee, to be delivered at the Gas Offices, Bolton, not later than 9.30 a.m. on Friday, the 29th of May, 1908.

SAMUEL PARKER,
Town Clerk.

Town Hall, Bolton,
May 14, 1908.

HARROW AND STANMORE GAS COMPANY.
BY ORDER OF THE DIRECTORS.

SALE OF 280 £10 "C" SHARES BY TENDER, BEARING A STANDARD DIVIDEND OF 7 PER CENT.

THESE Shares are receiving now 7 per Cent. Dividend.

The Standard Price is 4s. per 1000 cubic feet.

The present price of Gas is 3s. 7d. per 1000 cubic feet.

The overplus from the Standard Dividends for the Year 1907, when the price was 3s. 9d. per 1000 cubic feet, was used to create a Reserve Fund.

The increase in the Sale of Gas for the Year ended Dec. 31, 1907, over the corresponding period of 1906 was 19,633,000 cubic feet = 15 per cent.

For the Quarter ended March 31, 1908, the increased Sale, as compared with the same Quarter of last Year, is 6,514,000 cubic feet = 15·72 per cent.

No Tender will be accepted at a lower Price than £14 per £10 Share, or for less than Five Shares.

Particulars and Forms of Tender will be forwarded on Application at the Company's Offices, the Gas-Works, Harrow, Middlesex.

All Tenders must be delivered by Twelve o'clock on Thursday, May 21.

By order,
JAMES L. CHAPMAN,
Secretary.

May 1, 1908.